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"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish if such communications shall be long intermitted; and it will die away, if they shall entirely cease."—

Sir Wm. Jones.

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JOURNAL

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No. I. 1858.

Discussion of some Meteorological Observations made on Parisnath Hill, by Dr. G. von Liebig.

The following discussion of a few Meteorological observations made on the Parisnath Hill in 1856, I submit to the Society less because they contain any new facts, than with a view of drawing attention to the peculiar advantages offered in India for the investigation of meteorological questions by the great regularity of all atmospheric changes. A few days observations in this country will suffice to trace laws, the exhibition of which would, in Europe, require months and years of continued observation.

I would particularly wish to exhibit the use of conveniently situated stations, in different elevations, one above the other, as calculated to study the changes affecting the whole of the atmospheric strata between them.

Parisnath hill is situated nearly 200 miles to the North West of Calcutta, close to the Trunk road. The hilly country begins about 120 miles from Calcutta, near Raneegunge, and the general level, proceeding to the North West, is gradually raised. When the trunk road reaches the base of Parisnath hill, its level is about 900 feet above that of Calcutta. The hills between Raneegunge and Parisnath are not continuously connected with each other, they form no chain, but partake more of the character of isolated elevations, leaving tracts of open and undulating country between them.

Travelling to the North West, the hill is on the right of the Trunk road. Its crest runs from East and a few degrees South to the West and a few degrees North. Its highest points are at both ends, the first and higher one on the western, the second and lower one on the eastern termination; the distance between them is about a mile and a half. Midway and to the South of a straight line drawn between them is a third summit lower than either of the others, but differing very little from the second. This is a trigonometrical station, and its height, as taken from the revised calculations of the Records of the Calcutta longitudinal series is 4477.73 feet above the sea, or 4459.62 feet above the level of Calcutta. These three summits are connected by a slightly undulating ridge, the crest of the hill, on both sides of which the ground immediately begins to slope downwards, leaving only a narrow strip of ground to walk upon.—Immediately below the eastern or second summit, descending about 430 feet on the southern slope, stands, on a partly artificial base a small Jain temple, in the open verandah of which most of the barometrical observations were made. It is protected towards the North by the side of the hill, which is very steep and towards the East by a spur branching off from the summit above. Towards the South and the South West the view is open, but towards the West it is hemmed in by protruding masses thrown out from the centre of the hill.

Observations. The observations were made on the 1st, 2nd, 3rd and 4th of April, 1856. On the 4th I left the hill, and the last two observations on that day were made in the travellers Bungalow at Topchancee, a village near the foot of the hill.

On the hill during the first three days the sky was cloudless, with the exception of a few occasional stratus-clouds in the South West, and the atmosphere, in the middle of the day was hazy and not very transparent. The wind on the summit was a breeze from the North West. On the morning of the 4th, white clouds from the South were travelling northward; about midday they became very dense and formed a good protection against the sun.

In Calcutta, from the 1st to the 3rd, the sky was clear and the wind from the South and South West. On the 4th, the southerly breeze was stronger than on the preceding days, and during the day the aspect of the sky was cloudy.

It appears that from the 1st to the 3rd, the southerly wind, which was at first only observed at Calcutta, had, gradually progressing, replaced the North Westerly breeze at Parisnath, the change having been completed on the 4th.

The barometer used on the hill was a mountain barometer by Adie, suspended in a tripod, which had been compared with the standard barometer of the Calcutta Observatory; before each reading, the surface of the mercury in the cistern had to be adjusted to the scale. All observations, with the exception of those on the summits, were taken in the open verandah of the temple. The instrument, to avoid the sun, had to be carried from one part of the verandah to the other, several times during the day.

The thermometers were centigrade; they had not been compared with the standard of the observatory, but with another reliable standard. The temperature of the air was measured in the shade of a small tree on the North side of the temple, between it and the hill side, a place, which was little accessible to the direct rays of the sun, but where the air circulated freely.

A few observations with the wet bulb thermometer were made on the 2nd and 3rd April.

The Calcutta observations have been obtained through the kind permission of Major Thuillier from the Register of the Observatory, where observations are taken every hour.

The following table gives the readings of the barometer and thermometer on the hill, and those at the corresponding hours at Calcutta. The barometrical readings of both places are corrected for temperature and those of the hill also for the standard barometer of the Observatory. The thermometrical readings are also corrected.

I.—Table of

	1st April.						2nd April.				
Time.	Temple.		Second Summit.		Calcutta.		Time.	Temple.		Calcutta.	
h. m.	Bar.	Ther.	Bar.	Ther.	Bar.	Ther.	h. m.	Bar.	Ther.	Bar.	Ther.
6	25.963	21.6			29.850	25.7					
,, 30	..	..			..	..			22.3		25.7
7	25.980	21.9			29.875	26.0					
,, 40	25.999*	22.5*	25.611	21.4	29.892*	27.2*					
8	26.009*	22.6*			29.900	27.7					
,, 15	26.016	22.9			29.903*	28.1*					
9	26.032	23.1			29.913	29.1	9				
,, 30	26.042	23.8			29.915*	30.0*	,, 15	25.992	23.9	29.880	30.1
10	26.044	24.5			29.918	30.9	10	..	..	..	
....	..	..			..	..	,, 15	26.002	24.3	29.877	31.8
11	26.040	25.8			29.902	32.1					
Noon	26.021	27.2			29.880	34.0					
1	26.006	28.1			29.842	34.5					
2	25.973	29.1			29.806	35.6					
3	25.951	28.0			29 787	36.1					
4	25.928	27.3*			29.772	36.1	4				
,, 40	..	..			29.765*	35.5*	,, 55	25.885	27.1	29.716*	35.6*
5	..	26.6*	25.553	25.4	29.762	35.2	5	25.884*	27.0*	29.715	35.5
,, 25	25.942	26.3			29.762*	34.4*		..	..	..	
6	25.957	25.0			29.763	33.1	6	25.885	25.7	29.716	33.3
7	..	24.8*			29.779	31.3					
8	25.964	24.6			29.796	30.0					
	..	..			..	..					
	..	..			..	..					
	..	..			..	..					
	..	..			..	..					

Interpolation.—All observations in the table marked with a star, are interpolated. This was done graphically on paper, lithographed for the purpose. A horizontal and a vertical system of straight lines, crossing each other, formed a network of accurately drawn minute squares, each of one millimetre side. By means of this network the barometric curve could be designed on any convenient scale, and where the interval of time between two observed points was not greater than one or two hours, a straight line, connecting

Observations.

Time.	3rd April. Temple.		3rd April. Highest Summit.		3rd April. Calcutta.		4th April. Temple.		4th April. Calcutta.	
h. m.	Bar.	Ther.	Bar.	Ther.	Bar.	Ther.	Bar.	Ther.	Bar.	Ther.
6	..	..			..	..	25.894	19.3	29.778	27.2
„ 30	..	..			--	..	25.905	20.8	29.786*	27.3*
7	..	..			..	..	25.909	20.9	29.795	27.4
„ 40	..	..			..	..	..	..	..	..
8	25.944	22.6			29.816	28.7	25.928	21.6	29.811	28.5
„ 15	..	..			..	..	..	..	..	..
9	25.916	24.0			29.837	30.1	25.952	25.1	29.831	29.7
„ 30	..	..			..	..				
10	25.972*	25.9*			29.849	31.7				
„ 10	25.971	26.2			29.847*	31.9*				
11	25.968*	27.0*			29.836	33.2				
Noon	25.960*	28.0*	25.508	25.5	29.816	33.9				
1	25.935*	29.0*			29.781	35.0	Top chancee.			
2	25.903	30.0			29.740	36.1	28.817	35.0	29.733	34.1
3	25.872	29.8			29.712	36.3	28.794	34.6	29.713	33.9
4	25.856	29.0			29.701	36.0				
„ 40	..	..			..	..				
5	25.849	28.1			29.691	34.7				
„ 25	..	..			..	..				
6	25.852	26.6			29.698	32.3				
7	25.860*	26.2*			29.705	31.0				
8	25.872*	25.7*			29.726	29.5				
„ 30	25.885	25.5*			29.740*	29.1*				
9	25.893	25.2			29.754	28.7				
„ 30	25.903	25.2			29.762*	28.6*				
10	25.907	25.3			29.770	28.5				

them, gave the reading of the intermediate smaller divisions of time. Where the interval was greater, a knowledge of the shape of the curve at the particular time of the day was employed in drawing the connecting piece of the curve. This method of interpolation could only be followed with a sufficient approach to correctness, where the curve did not deviate much from a straight line. The only instance of the interpolation of a larger interval was that of the hours 11, noon and 1 on the 3rd, and it will be seen further on,

that the interpolated values could not have differed from the real ones more than the unavoidable smaller errors of observation might have amounted to.

The temperatures were interpolated in a similar manner.

The curves Fig. 1 and 2 in the plate graphically represent the hourly changes of the barometer, the first at Calcutta where the observations were complete for the 24 hours, and the second on Parisnath hill.

In constructing the curve of the hill, the hours after 4 P. M. on the 1st have not been included. Their readings are indicated by dots in the figure. The general regularity of all other parts of the curve in themselves as well as with reference to the Calcutta curve, and the absence of disturbing influences in the atmosphere at the time, justify a conclusion that the observations of the hours in question should not have formed an exception to that regularity. Taking into consideration some other external circumstances, accompanying these observations, which could have contributed to make them uncertain, and no data being available for correcting them, they were rejected. Their evidence goes only so far with certainty as to show the turning of the curve in the evening between 4 and 5 P. M. The observations of the 2nd April could also be used only for general conclusions. The first, at 9 h. 15 m. A. M. is evidently erroneous, as will be seen further on, from the curve of real mean temperatures.

The observations on Parisnath hill were made by Calcutta time. The difference in Longitude between Calcutta and Parisnath is 2° 29′ 23″ which would correspond to between 9 and 10 minutes time. This difference is so small that it would produce no sensible effect upon the barometrical hours, and its influence may therefore be neglected in comparing the observations at both places with each other.

I shall now enter upon a closer examination of the observations made on the 1st, 3rd and 4th April, omitting those of the 2nd and also the barometric readings of the hours after 4 P. M. on the 1st, retaining however the temperatures of these hours.

Barometric Curves.—The barometric readings for the full hours are given in the following table:—

Table II.—Hourly Barometric Pressures.

Time.	1st April. Temple.	1st April. Calcutta.	1st April. Diff.	3rd April. Temple.	3rd April. Calcutta.	3rd April. Diff.	4th April. Temple.	4th April. Calcutta.	4th April. Diff
6	25.963	29.850	3.887	..	29.771	..	25.894	29.778	3.884
7	25.980	29.875	3.895	..	29.785	..	25.909	29.795	3.886
8	26.009*	29.900	3.891	25.944	29.816	3.872	25.928	29.811	3.883
9	26.032	29.913	3.881	25.961	29.837	3.876	25.952	29.831	3.879
10	26.044	29.918	3.874	25.971	29.847**	3.876			
11	26.040	29.902	3.862	25.968*	29.836	3.868			
Noon	26.021	29.880	3.859	25.960*	29.816	3.856			
1	26.006	29.842	3.836	25.935*	29.781	3.846			
2	25.973	29.806	3.833	25.903	29.740	3.837			
3	25.951	29.787	3.836	25.872	29.712	3.840			
4	25.928	29.772	3.844	25.856	29.701	3.845			
5	..	29.762	..	25.849	29.691	3.842			
6	..	29.763	..	25.852	29.698	3.846			
7	..	29.779	..	25.860*	29.705	3.845			
8	..	29.796	..	25.872*	29.726	3.854			
9	..	29.813	..	25.893	29.754	3.861			
10	..	29.823	..	25.907	29.770	3.863			

** In this and the following tables the place opposite the hour of 10 A. M. on the 3rd is always occupied by the reading obtained at 10 h. 10 m. This hour had been observed on the hill and was easily interpolated for Calcutta.

The most striking feature of the barometrical curves is their great regularity. The shape of the curve of one day is like that of the next, and the transition from hour to hour is as gradual and imperceptible, as if we had before us the means of a month or a year, instead of having the observations of only a single day.

The pressure is falling without interruption at both stations on the 1st, 2nd and 3rd April. The following are the mean pressures on each day at Calcutta and on the 1st and 3rd on the hill. Those at Calcutta were taken from the hourly observations of the Observatory, those on the hill were derived by the combination of hours

$\frac{\text{VIII. } a + \text{IV. } p. + \text{I. } p. + \text{II. } p.}{4}$, which gives, for Calcutta, a tolerably good approximation to the mean.*

Mean daily pressure.	1st.	2d.	3d.	4th.
Calcutta,..................	29.830	29.789	29.758	29.759
Hill, ...	25.979	——	25.909	——
Difference, ...	3.851		3.849	

The rate of falling was about the same at both stations. This diminution of the pressure was doubtless connected with the change in the wind during the same period, the current from the South or South-west displacing the North-westerly breeze.

It is seen from the table or the figures that the turning points of both curves during the day fall within admissible small limits, upon the same hours, and we may infer from the direction of the curve on the hill, in such places, where it is interrupted, that the maxima and minima during the night would have shown the same coincidence, had they been observed. The curve of the hill differs in so far from the Calcutta curve, as it is flatter, the extent of its daily variation being smaller. In the figure, the parts of the curve between the hours at which the observations had been interrupted, have been filled up with dotted lines for no other purpose, than better to define the position of such parts as had been observed. The readings substituted for the unobserved hours and also the manner in which they have been obtained, are given in the appendix.

The great regularity of the barometrical curves and the coincidence of their turning points, promising an equal regularity in all other atmospheric changes during the same period, has encouraged me to make the attempt to complete such data as were wanting in the small number of observations at my disposal, with a view of obtaining a complete picture of the atmospheric processes on the 1st and 3rd of April. Obliged as I have been in doing so, to have recourse once or twice to more or less conjectural estimations, the

* The means derived by this combination are generally about 0.006 inches too low. For the month of April, 1856, it differs — 0.004.

The means of the four days from the 1st to 4th April, derived by the combination for Calcutta, are

Mean daily pressure.	1st.	2nd.	3rd.	4th.
Calcutta,.........................	29.830	29.793	29.759	29.751
Difference, from real daily mean,	0.000	+0.004	+0.001	—0.008

result has proved that they did not exceed the limits within which direct observations might have been equally liable to deviation.

Temperature.—The following table contains the hourly temperatures observed at both stations on the 1st, 3rd and 4th April:—

Table III.—Observed Temperatures.

	1st April.				3rd April.				4th April.			
Time.	I. Temple.	II. Calcutta.	III. Diff.	IV. Mean.	I. Temple.	II. Calcutta.	III. Diff.	IV. Mean.	I. Temple.	II. Calcutta.	III. Diff.	IV. Mean.
6	21.6	25.7	4.1	23.6	21.3**	26.0	4.7	23.6	19.3	27.2	7.9	23.2
7	21.9	26.0	4.1	23.9	..	26.7	..	..	20.9	27.4	6.5	24.1
8	22.6*	27.7	5.1	25.2	22.6	28.7	6.1	25.1	21.6	28.5	6.9	25.0
9	23.1	29.1	6.0	26.1	24.0	30.1	6.1	27.0	25.1	29.7	4.6	27.4
10	24.5	30.9	6.4	27.7	25.9*	31.7	5.8	28.8				
11	25.8	32.1	6.3	28.9	27.0*	33.2	6.2	30.1				
Noon	27.2	34.0	6.8	30.1	28.0*	33.9	5.9	30.9				
1	28.1	34.5	6.4	31.3	29.0*	35.0	6.0	32.0				
2	29.1	35.6	6.5	32.3	30.0	36.1	6.1	33.0				
3	28.0	36.1	8.1	32.0	29.8	36.3	6.5	33.0				
4	27.3*	36.1	8.8	31.7	29.0	36.0	7.0	32.5				
5	26.6	35.2	8.6	30.9	28.1	34.7	6.6	31.3				
6	25.0	33.1	8.1	29.0	26.6	32.3	5.7	29.4				
7	24.8*	31.3	6.5	28.0	26.2	31.0	4.8	28.6				
8	24.6	30.0	5.4	27.3	25.7*	29.5	3.8	27.6				
9	..	28.9	..	..	25.2	28.7	3.5	26.9				
10	24.2**	28.5	4.3	26.3	25.3	28.5	3.2	26.9				
Mean of 24 hours.	24.4	30.1	5.7	27.3	25.4	30.4	5.0	27.9				

** The temperatures for these hours have been estimated.

The maximum heat at both stations is a little higher on the 3rd than on the 1st; the hours of the maximum are 2 P. M. on the hill and 3 P. M. at Calcutta.

The mean temperature from all observations of the 24 hours at Calcutta is for the 1st 30°.1, and for the 3rd 30°.4. With these the values derived by the combination $\frac{\text{VI. a.} + \text{X. a.} + \text{IV. p.} + \text{X. p.}}{4}$, which gives very good means for many parts of India, closely agree; they are 30°.3 for the 1st, and 30°.5 for the 3rd April. In employing this combination for the hill, where the observations extend over only a part of the 24 hours, the temperatures for 10 P. M. on the 1st and for 6 A. M. on the 3rd, had to be estimated by analogy. This is certainly a very imperfect method, but it may be admitted in the present case, as the general state of the atmosphere was the same on both days; and the limits are so well defined, that the error can hardly amount to more than about half a degree, which divided by 4 becomes still more diminished. The estimated temperatures are put down opposite these hours in the table. The daily means derived in this manner for the hill are on the 1st 24°.4 and on the 3rd 25°.4.

The hour in the morning of which the temperature approaches nearest to the mean of the whole day falls between 9 and 10 A. M. at Calcutta, and at 10 A. M. on the hill.

The differences between the hourly temperatures at Calcutta and the hill on the 1st and 3rd (Cols. III.) are smallest in the morning and evening and increase towards 4 in the afternoon, when they reach their maximum on both days: 8°.8 on the 1st and 7° on the 3rd. The variation during the night has not been observed. On both these days the variation progresses with great regularity towards the maximum, but on the 4th it begins less regular, owing, doubtless to the formation of clouds on that day.*

Column IV. in the table gives the hourly means, computed from the observations at both stations; their curve is represented in fig.

* I have reason to suspect that the temperature observed on the hill at 9 on the 4th is too high. It was taken after the thermometer had been removed from the sheltered spot described above, previous to its being packed up for leaving the hill.

3. Here, the maximum on the 3rd is also a little higher than on the 1st; it occurs at 2 P. M. on the 1st; while on the 3rd the temperature at 3 is the same as at 2 P. M.

Taking the values obtained for the means of the whole day at each station, 30°.1 and 24°.4 on the 1st, and 30°.4 and 25°.4 on the 3rd, the daily mean temperatures for the air between the stations will be 27°.3 for the 1st, and 27°.9 for the 3rd, showing a difference of 0°.6. The combination $\frac{\text{VI. a.} + \text{X. a.} + \text{IV. p.} + \text{X. p.}}{4}$ applied to the hourly means, will give very nearly the same results, viz., 27°.6 and 27°.9. The temperature at 9½ A. M. approaches nearest to the mean temperature of the 24 hours on both days.

The hourly means, derived from the observations at both stations are supposed to represent the mean temperatures of the stratum of air extending between the two stations, and they enter as such into the calculation of the height. It is well known that they have not, in reality, that signification, and to distinguish them from the real mean temperatures, I shall speak of them, in the following pages, as the mean temperatures of the stations.

Height.—The height of the temple and the summits was calculated by Gauss's formula, with the corrections for the decrease of gravity by latitude and elevation. The results in English feet, are arranged in the following table by the hours.

Table IV.—Difference of Height between

Time.	Calcutta and the Temple. 1st April.	3d April.	4th April.	The Temple and Second Summit.	The Temple and Highest Summit.	Calcutta and Second Summit.	Calcutta and Highest Summit.
				1st April. 7 h. 40 m. A. M. 429.4	3d April. 12 Noon. 510.5	1st April. 7 h. 40 m A. M. 4452.0	3d April. 12 Noon. 4585.1
				4 h. 40 m. P. M. 422.5		4 h. 40 m. P. M. 4494.3	
6	4009.5	..	4010.7				
7	4019.2	..	4023 7				
8	4029.5	4027.1	4031.3				
9	4029.7	4049.0	4058.4				
10	4044.5	4076.8*					
11	4051.6	..					
Noon.	4075.4	4086.5					
1	4065.0	4095.6					
2	4032.1	4106.6					
3	4084.0	4115.7					
4	4090.2	4113.6					
5	..	4094.1					
6	4051.7	4070.6					
7	..	4056.1					
8	4009.3	4045.2					
9	..	4042.8					
10	..	4042.0					

Difference of Height between Calcutta and Topchancee.

4th April.
2 P. M. 935.1
3 „ „ 938.0

* The height opposite 10 A. M. on the 3rd was derived from the observation at 10 h. 10 m.

The resulting height becomes greater as the day advances and reaches its maximum at 3 and 4 P. M., about which time the difference between the temperatures of the two stations is also greatest. It decreases towards evening and is smallest about the time of the lowest observed temperature at 6 A. M. It is well known that the cause of this variation lies in the difficulty of obtaining at all hours the real value of the mean temperatures of the column or stratum of air between the two stations.

A solid body and generally the solid surface of the ground, cools and heats quicker than the air in contact with it. In other words, it becomes hotter and colder in the same space of time, if exposed to the same heating and cooling influences—the sun during the day or a clear sky at night. This does not necessarily affect the mean

temperature for a period of 24 hours, which might be the same for the air and the ground.

As the atmosphere receives the greater part of its heat not directly from the rays of the sun, but indirectly, from the surface of the ground, the change of the hourly temperatures of the air will follow the extremes of the ground more closely when it is in immediate contact with it, than when further removed from the surface. The temperatures observed at each station as well as the hourly means derived from both, will therefore show a greater daily and hourly variation, than those of the column or stratum of air between them would, if they could be observed. It is only in the means of the whole of the 24 hours, where the extremes of hot and cold compensate each other, that the mean temperatures of the stations can be supposed to agree with the real mean temperatures of the air.

If we assume the mean temperature of the whole day, as taken from the hourly observations at both stations to be the same, or nearly the same, as that which would be obtained from the real hourly mean temperatures of the whole mass of air between them, then the curve of the hourly means of the stations will, in consequence of its greater variation, rise higher above the line of the common mean temperature during the day and sink deeper below it during the night, than the curve of the real hourly mean temperatures.

These curves must cross each other twice during the 24 hours, once in the morning, and once in the evening. At the moment of crossing the temperature of both is the same, and if the temperatures and the pressures be then observed, the resulting height must be the true one.

To obtain from the results in the table the true height of the temple, it will be necessary to find in the curve of the hourly mean temperatures of the stations, the hours of which the temperature will coincide with the real mean temperature of the column of air between the stations.

It is at once apparent that this hour cannot be far distant from the hour which will show the mean temperature of the 24 hours, in the present case about $9\frac{1}{2}$ A. M.

The crossing will take place after $9\frac{1}{2}$, if the curve of real mean temperatures should reach its daily mean, which I have assumed to

be the same or nearly the same, as that of the stations, earlier than the curve of the stations. If later it will take place before $9\frac{1}{2}$.

Considering (Fig. 3,) the rapid ascent of the mean temperature of the stations from 6 A. M. to 2 P. M.—it rises in 8 hours to the same height, from which it takes 16 hours to descend again—and the necessarily retarded progress of the real mean temperature of the stratum of air from its lowest point to its highest, it becomes extremely improbable, that the latter, although its starting point at 6 A. M. is a little above that of the former, should at $9\frac{1}{2}$, after only 3 hours, have reached a higher point than the temperature of the stations.

If I therefore take 10 A. M. as the extreme limit in the direction of the rising temperature, this will probably be a little higher than would be strictly required. It now remains to find the limit on the side of the lowest temperature. 6 A. M. being the hour of the minimum of the day, is out of the question. The temperature at 7 A. M. having risen comparatively little above that at 6, is probably too low, but to make up for the transgression on the other side, I will fix upon 7 as the lower limit.* Among the results included between the hours of 7 and 10, the true height must be found.

To be certain, I have taken the mean between the heights at 7, 8, 9 and 10 on the 1st, 3rd and 4th, a combination, in which the higher and lower values would partly compensate each other. The observations were complete for these hours on the 1st April. On the 3rd, the hour of 7 and on the 4th the hour of 10 had not been observed. For each of these the mean of the values at the same hour on the two other days was taken instead.

The resulting height is 4039.3 feet.

I have stated that the trigonometrical station, which is very little lower than the second summit, directly above the temple, was 4459.62 feet above the level of Calcutta, by the Records of the Longitudinal Series. The second summit is, by an observation taken at 7 h. 40 m. A. M. on the 1st April, 429.4 feet higher than the temple, a result, which is probably a little too low. This added to the computed height of the temple, 4039.3 feet, would make the

* In Europe the best time for taking heights barometrically is between 8 and 9 A. M.

second summit 4468.7 feet above Calcutta, or 9 feet higher than the trigonometrical station. This can hardly differ much more than about 10 feet from the real height.

*Real Mean Temperatures.**—The real hourly mean temperatures of the stratum of air between the two stations, are found, by introducing into the Barometrical formula the known value of the height (H.) and the observed Barometrical pressure (b, b'). The shape of the equation will be this—

$$t + t' = \text{num} \left\{ \text{Log H} - c - \text{Log} \left\{ \text{Log} \frac{b}{b'} \right\} \right\} - 2\,a$$

where $t + t'$ stands for the sum of the temperatures of both stations. H, c and a are constant quantities for all hours. An error of 10 feet in the height of the temple (4039.3 feet) would cause a difference of about 0°.7 in the temperature of each hour, but it would not alter the character of the curve or the magnitude of the variation. The following table contains in the second column under each day, the real mean temperatures as obtained by the formula :—

Table V.—Real Mean Temperatures.

	1st April.			3rd April.			4th April.		2nd April.	
Time.	I. Observed Means.	II. Calculated.	III. Corrected.	I. Obseaved Means.	II. Calculated.	III. Corrected.	I. Observed Means.	II. Calculated.	I. Observed Means.	II. Calculated.
6	23.6	25.6	..	23.6	..	..	23.2	25.2		
7	23.9	25.3	..	..	..	..	24.1	25.2		
8	25.2	25.9	..	25.1	26.5	26.2	25.0	25.5		
9	26.1	26.7	..	27 0	26 4	..	27.4	26.1	27.0	25.9**
10	27.7	27.3	..	28.8	26.5*	26.7			28.0	26.9**
11	28.9	28.1	.	30.1	27.0	27.1				
12	30.1	28.1	28.5	30.9	27.7	27.6				
1	31.3	29.7	29.2	32.1	28.1	..				
2	32.3	29.4	..	33.0	28.4	..				
3	32.0	29.0	..	33.0	27.9	28 0				
4	31.7	28.1	..	32.5	27.4	27.6				
5	30.9	..	..	31.3	27.5	27 4			31.2	28.8
6	29.0	..	..	29.4	27.3	..			29.5	28.6
7	28.0	..	..	28.6	27.4	27.1				
8	27.3	..	..	27.6	27.0	..				
9	..	..	..	26.9	26.7	..	* 10 h. 10 m.		** 9 h. 15 m. 10 h. 15 m.	
10	26.3	..	..	26.9	26.7	..				

* A. and H. Schlagintweit, Neue Untersuchungen, &c. &c. Leipzig 1854. Page 409.

The curve of the real hourly mean temperatures, Fig. 4, a. presents on the 1st and 3rd April some slight inequalities, which must be corrected, in order better to exhibit the real shape of the curve. We know that the ascent from the minimum in the morning to the maximum in the afternoon, must be gradual and continuous, uninterrupted by irregular and sudden deviations. The corrections will have to be regulated by the turning points of the curve, which it is therefore of importance to fix beforehand.

In a similar case* the maximum hour of the real mean temperatures of the air between the stations has been found, in a greater height, to fall after the maximum hour of the mean temperatures of the stations.

In the present case the shape of the curves of both days distinctly forbids us to look for the maximum after 2 P. M. On the 1st there is a doubt between 1 and 2 P. M., but on the 3rd the hour of 2 P. M. decisively predominates. The hour of 2 P. M. also preponderates in the hourly means of the stations, and, such being the case, theoretical reasons, as well as experience, speak strongly against the occurrence of the real maximum of the air between the stations before that hour. In the present instance the height of the stratum of air is so small, that a near coincidence of the hour of its maximum temperature with that of the maximum temperatures of the stations cannot be considered irregular, and we may safely admit the hour of 2 P. M. as that of the maximum temperature in the curve of the real hourly means.

The hour of the minimum, 7 A. M., which is clearly indicated as such on the 1st and not contradicted on the 4th, was not altered, as there are reasons, which will be mentioned further on, for considering a further slight decrease of the temperature of the air for a short time after sunrise, as a not unusual occurrence. The corrections were effected graphically, by adopting, wherever the continuous line was broken, a mean course between the deviations on either side, supposed to have been caused by the real mean temperatures having been found too high or too low. They are put opposite the respective hours in Col. III. of the table. On the 1st April only the hours 12 and 1 required readjustment, all others having been taken as correct.

* A. and H. Schlagintweit, K. C.

The mean temperatures of the 2nd have been inserted in the table, merely to show the reason for rejecting the barometrical observations of the hours of 9 h. 15 m. and 10 h. 15 m. A. M. made on that day on the hill. The parallelism of the real mean temperatures of these hours with those of the mean curve of the stations clearly indicates that one of the two readings must have been erroneous. The number of observations on that day is not sufficient to warrant an attempt at correcting them.

The curve of the 3rd April presents some difficulties, the temperatures at 8 and 10 A. M. are equal and both higher than that at 9. This arrangement could not by any means represent the true relation between them.

There being no direct and certain indications to guide us in selecting one of these temperatures as correct, which might then serve as a starting point in altering the other two, the following considerations decided me at last in favour of the temperature at 9.

It will be recollected from Table III. that the mean temperatures of the air between the stations for the whole 24 hours, as derived from the thermometric observations (Col. IV.), showed a difference of only 0°.6. Assuming that the real daily mean temperatures of the air on both days would differ rather less than more in the same or the opposite direction, from each other, and that, judging from observations made by others, they would fall later than the hour at which the daily means had been observed to fall in the curve of the mean temperatures of the stations, which was 9½ A. M., I have concluded that the difference between the real hourly mean temperatures of both days would be greater after that hour, in the hot part, than before it in in the cold part of the day. Guided by this supposition it might be expected that the real mean temperature of the hours 8, 9 and 10 on the 3rd, would differ comparatively little from those at the same hours on the 1st.

This was made still more probable, from the small range of the curves, which is less than half that of the curves of the stations.

The temperature at 9 on the 3rd 26°.4 (Table V. Col. II.) agreeing nearest, within the probable limits, with the temperature of the same hour on the 1st, 26°.7, I have taken it as the correct one.

Next the hours 1, 2, 6, 8, 9, 10 were considered correct and the remaining hours were altered as the table shows, (Col. III). Fig. 4 in the Plate represents the corrected curves.

On the 4th April no alterations were required.

Having adopted these corrections, I now proceed to point out the distinguishing features of the curves of real hourly mean temperatures, Table V. (Fig. 4).

In the first place they have a much smaller range than the temperatures derived from the observations (Col. I.) The range of the latter, on the 1st is 8°.7, on the 3rd it is 9°.5, whereas the range of the real means, between 7 and 2, is on the first only 4°.1, not quite half of that of the temperatures of the stations. On the 3rd, the barometer had not been observed at the hour of the minimum, but judging from the small hourly variation, the daily range on that day must have been still smaller than on the 1st.

It is not possible to arrive at a definite conclusion regarding the absolute real daily mean temperatures on both days; the possible error in the height and the error which might arise from different degrees of moisture on both days would make it uncertain. The relative values of the real daily mean temperatures as compared with each other, are also difficult to ascertain. The smallness of the number of observations hardly allows an estimate being formed from them. An estimation or interpolation for some of the deficient hours could not be made with the same reliance as in the instance of the mean curve of the stations, and the fitness of the combination of hours which had been employed before, would have been to say the least, doubtful.

As far as a conjecture may be permitted from the average hourly variation on the 3rd, the minimum temperature on that day could not have been more than about half a degree higher than that on the 1st. But the maximum temperature of the 3rd is a whole degree lower than that of the 1st, a difference of the same magnitude, but in an opposite direction as that between the maxima of the curve of the stations. If therefore the real daily mean temperatures of both days were not the same, the probability is, that the real mean temperature of the 24 hours on the 3rd was lower than that on the 1st. The case is the reverse as regards the daily mean

temperature of the stations, which on the 3rd is higher than on the 1st.*

The only consequence which could possibly be inferred from this would be, that on successive days the course of the daily mean temperatures of larger masses of air, removed from the ground, does not always proceed parallel to the daily means of the stations; the latter may be rising when the former are falling or remaining stationary, or the reverse.

In the present case, the small number of days and the omission of taking the moisture into account does not allow us to consider this result as an established fact; but the possibility of such an

* Such a result might have been predicted from the decrease in the barometrical pressure from the 1st to the 3rd. The height obtained by the barometric formula

$$H = C \operatorname{Log} \frac{b}{b'} (1 + \beta T)$$

(omitting the smaller corrections for gravity) depends mainly on the value of the quantity $\operatorname{Log} \frac{b}{b'}$. This value will increase, when the barometrical pressures decrease, if the difference between the latter, (b—b′) remains the same. In such a case, to obtain a constant value for the height, the mean temperatures should decrease with the pressures. We are, on the contrary, accustomed to see the temperatures at the stations rising, when the pressures are falling, and such is also the case in the present instance. The barometer from the 1st to the 3rd is falling and the hourly mean temperatures of the stations on the 3rd are higher than on the 1st, but the barometrical differences (b—b′) being, on the whole, very nearly the same on both days, it follows that we must find the real mean temperatures on the 3rd lower than on the 1st. To give an instance to which extent the temperature is dependent on the value of (b—b′) I will take the observation at 2 P. M. on both days. The barometrical differences were on the

1st.	3rd.
3.833	3.837

and the real mean temperatures were found to be

29°.4	28°.4.

showing a difference of one degree. To make the real mean temperature at 2 on the 3rd equal to that on the 1st, or one degree higher than we found it, the barometrical difference on the 3rd should have been 3.824, or 0.013 inches less than it was. This would have required a barometrical pressure of 25.916 inches on the hill instead of 25.903, a difference which is far too great as to have been caused by an error in the reading.

occurrence may at least be admitted. Such an admission will be sufficient to encourage further investigation into the subject.

An explanation of such a phenomenon would not only require a favourable state of the atmosphere, and observations extending over a greater number of days, but also accurate determinations of moisture and the direct observation of the greater or smaller resistance which the atmosphere offers to the passage of the sun's heating rays. It would besides have to take into account the changes in the specific gravity of the air with a rising and falling Barometer. Particular care would have to be taken to guard the thermometers against the influence of direct radiated and reflected heat from the ground. No other climate is so well adapted as that of India to bring to a satisfactory conclusion an examination into the conditions of such a phenomenon, and stations in similar relative situations as Parisnath hill and Calcutta may be found in many parts of the country.

The course of the hourly mean temperatures of the stratum of air presents another difference from the means of the stations. In India the minimum temperature is, as a general rule, observed at 6 A. M., this being the first hour of observation after, or the last hour before sunrise. In the present instance the minima in the curves of the stations, for both days, fall upon 6 A. M. It is different with the curves of real mean temperatures of the stratum of air. On the 1st, we find the minimum at 7,—on the 2nd and 3rd the hours of 6 and 7 had not been observed,—but on the 4th the temperature at 7 has not risen above that at 6. It is not surprising that the lowest temperature of the air, far removed from the ground, should occur a short time after sunrise. The air receives its temperature chiefly from the ground and some time must be required to heat the latter, and also to communicate this heat to the air in which, in the mean time the process of cooling must go on. I have (at Baroda), only six feet from the ground, in the shade of a house towards the North and protected from the rays of the rising sun, frequently observed the temperature still falling for a quarter and half an hour after sunrise, the decrease between sunrise and the moment when the temperature commenced to rise again amounting to 2 or 3 tenths of a degree Centigrade.

This phenomenon will most likely be observed only under favorable circumstances and in places where the ground remains in the shade for some time after sunrise. Mr. Radanath Sikhdar in charge of the observatory at Calcutta, where once or twice every month readings of the thermometer are taken from ten to ten minutes before and after sunrise,* has noticed the same circumstance. His kindness has enabled me to give the following table, containing the observations made on the 22nd January, 7th and 23rd February and 21st March, 1857. The state of the weather on those days was particularly favourable, there having been no clouds or rain, which, in all other months are apt to interfere with the regularity of the phenomenon. I give the readings in degrees Fahrenheit, the scale by which they have been observed.

1857.	Minutes before sunrise. 20	10	Sunrise. 0	Minutes after sunrise. 10	20	30	40	50	60
22d January,	54.0	53.9	53.8	53.7	53.6	53.6	53.6	53.7	
7th February,	63.0	62.9	62.8	62.6	62.4	62.2	62.0	62.0	62.3
23d February,	70.0	70.0	69.8	69.8	69.5	69.4	69.3	69.5	69.8
21st March,	74.8	74.6	74.7	74.7	74.6	74.6	74.8	75.2	
Means, ...	65.45	65.35	65.27	65.20	65.02	64.95	64.92	65.20	

Looking at the means, we find that the lowest temperature took place forty minutes after sunrise and the difference between the temperature at sunrise and the lowest temperature, is 0°.35 F. or about 0°.2 C.

Correction of the Barometrical readings.—The alterations to which it has been necessary to subject the curve of the real mean temperatures, in order to reduce its smaller irregular deviations, involve an examination of the barometrical readings from which these temperatures have been derived. From the formula for the calculation of the real mean temperatures, given above, it is seen that the value of the tem-

* Since January 1857.

perature solely depends on the quantity Log $\frac{b}{b'}$, all other terms of the equation being constant quantities for all hours. An error in the temperature would therefore indicate an error in one of the barometrical readings, or in both. Having corrected the temperature, we shall be enabled to find the magnitude of the error in the barometrical reading at the one station, provided that of the other can be relied on.

The error to which barometrical observations are liable, is composed of two parts—the unavoidable error, which is attached to every reading and depends on the imperfection of the instruments and of the eye of the observer, and the incidental error, caused by unfavourable external circumstances attending the observation, as for instance shaking of the instrument, a bad light, unsteadiness of the eye from muscular exertion, &c. In converting the readings of one instrument into those of another with which it had been compared beforehand, the unavoidable error is included in the small allowance which must be made in adding the correction. In the present case this allowance amounts to $\pm$ 0.003 inches. The incidental error cannot well be estimated. It must be more or less irregular and may be greater or smaller than the unavoidable error; generally greater.

In cases like the present, wishing to correct the errors as far as possible, we must be satisfied to assume the readings of one of the stations as correct and alter those of the other, being guided in our selection by the circumstances of the case. Such a proceeding can not lead wrong so long as the corrections do not exceed the probable limits of the errors of observation. Should they appear to do so, this would prove that in the first instance the correction of the temperatures must have been erroneous. So we have in these barometrical corrections a means of controlling to some extent the alterations made in the curve of real mean temperatures. In our case, the readings of the Barometer at Calcutta, the instrument being a standard, fixed in its position and never removed from its place, necessarily had been less exposed to incidental errors than those of the mountain barometer, which was frequently changed from one place to another and could not be suspended so as to avoid oscillation.

Taking therefore the observations at Calcutta as correct, the readings on the hill had to be altered to suit the corrected temperatures. It will be seen from the following table that these alterations, reaching at the most 0.005 inches, keep within the limits of admissible errors. This is in so far satisfactory, as it confirms the adjustment of temperatures, showing that the common incidental irregularities of the barometrical readings might have produced the deviations.

VI.—Table of corrected Barometrical Readings on the Hill.

Date.	Time.	Original Reading.	Corrected Reading.	Error.
1st April.	Noon.	26.021	26.026	+ 0.005
	1	26.006	26.002	— 0.004
3rd April.	8	25.944	25.940	— 0.004
	10*	25.971	25.974	+ 0.003
	11	25 968	25.969	+ 0.001
	Noon.	25.960	25,959	— 0.001
	3	25.872	25.873	+ 0.001
	4	25.856	25.858	+ 0.002
	5	25.849	25.847	— 0.002
	7	25.860	25.856	— 0.004

Barometrical Difference.—There is another way of controlling the curve of real hourly mean temperatures. It consists in comparing the curve with the course of the hourly variation of the difference between the barometrical pressures (b—b′), obtained by deducting the pressure of the upper station from that of the lower one. If the barometrical pressures at each station, as is generally assumed, represent the Mass of the atmospheric column which presses upon the Mercury of the barometer, their difference must give the weight of the column of air between the stations, measured by a column of Mercury of an equal basis.

The weight of a fixed volume of air, being dependent on the barometrical pressure and the temperature, changes in a direct proportion as the former and, to a certain extent, inversely with the latter. The variation in the weight of such a volume of air, when

* 10 h. 10 m.

the temperature changes from t′ to t″ and the pressure from b′ to b″, is expressed by the following equation:

$$\frac{S''}{S'} = \frac{a + t'}{a + t''} \cdot \frac{b''}{b'}$$

Where S′ and S″ stand for the weight of the same volume of air at the respective temperatures t′, t″ and under the pressure b′, b″. The constant $a = 272.85$; $\frac{1}{a} = 0.003665$ being the increase in volume of a quantity of air measured at 0° C. for every degree Centigrade above zero.

This equation expresses at the same time the ratio of the variation in the specific gravity of the air.

Applying this equation to the present case, we find that the factor $\frac{b''}{b'}$, within a period of 24 hours, changes in narrower limits than the factor $\frac{a + t''}{a + t'}$, which is dependent on the hourly variation of the temperature during the day. The latter therefore will preponderate in determining the value of the equation, and we may expect to find the hourly weight of the air between the two stations following a similar course as the real hourly mean temperatures, but in an inverse ratio, the smallest barometrical difference falling upon 2 P. M., and the highest upon 7 A. M. The following table, in Col. II., gives the hourly differences as found by deducting the pressure at Parisnath from that at Calcutta. For the corrected hours the differences obtained from the original readings on the hill have been placed opposite, in Col. I.

Table VII.—Barometrical Differences.

Time.	I. Original of corrected hours.	II. Observed and corrected.	III. Calculated.	IV. Deviation.	I. Original of corrected hours.	II. Observed and corrected.	III. Calculated.	IV. Deviation.	II. Observed.	III. Calculated.	IV. Deviation.
	1st April.				3rd April.				4th April.		
6	..	3.887	3.916	0.029	..	..	..	..	3.854	3.912	0.028
7	..	3.895	3.924	0.029	..	..	..	..	3.886	3.914	0.028
8	..	3.891	3.920	0.029	3.872	3.876	3.904	0.028	3.883	3.911	0.028
9	..	3.881	3.910	0.029	..	3.876	3.904	0.028	3.879	3.907	0.028
10	..	3.874	3.905	0.031	3.876	3.873	3.901*	0.028			
11	..	3.862	3.892	0.030	3.868	3.867	3.895	0.028			
Noon.	3.859	3.854	3.884	0.030	3.856	3.857	3.886	0.030			
1	3.836	3.840	3.870	0.030	..	3.846	3.876	0.030			
2	..	3.833	3.864	0.031	..	3.837	3.867	0.029			
3	..	3.836	3.866	0.030	3.840	3.839	3.868	0.029			
4	..	3.844	3.874	0.030	3.845	3.843	3.872	0.029			
5	..	..	..	..	3.842	3.844	3.873	0.029			
6	..	..	..	..	..	3.846	3.875	0.029			
7	..	..	..	..	3.845	3.849	3.877	0.029			
8	..	..	..	..	..	3.854	3.883	0.029			
9	..	..	..	..	..	3.861	3.889	0.028			
10	..	..	..	..	..	3.863	3.891	0.028			

* 10 h. 10 m.

Examining Col. II. we find, that on the 1st and 3rd April, the barometrical differences decrease steadily from 7 A. M. till 2 P. M. and rise again after that hour.

The hour of the maximum weight on the 1st and 4th coincides with that of the minimum temperature at 7 A. M. and the hour of the minimum weight on the 1st and 3rd with the hour of the highest temperature 2 P. M. on those days. If the values of the difference, derived from the uncorrected barometrical readings on the Hill, in Col. I., are substituted for the corrected values opposite in Col. II., the general character of the series remains the same, but they would produce slight irregularities at some hours which the cor-

rections have served to eliminate. Between the hours 8 and 9 A. M. on the 3rd, only, have the corrections failed to restore the course to that regularity, which prevails on the two other days, and the barometrical pressure on the Hill at those hours appears still too high; but as any further alteration would only have been arbitrary, it was not attempted.

The general conformity of the variation in the hourly weight with the course indicated by the real mean temperatures having thus been established, it remains to be proved, that the relation between the hourly weights strictly corresponds to the course prescribed by theory, with regard also to the barometrical pressure.

The shortest way to ascertain this, would be, to compute the weight of the column of air for every hour, and to compare the values thus theoretically obtained, with the observed barometrical differences.

Neglecting for the present the influence of the watery vapour contained in the atmosphere, the weight of the column of air between the stations, measured by a column of mercury of an equal basis at 0° C. would be expressed by the following formula:

$$S = \frac{H}{p} \cdot \frac{\alpha}{\alpha + t} \cdot \frac{b}{B}$$

where S stands for the weight.

H gives the height in English inches (Log H = 4.6854873);

p is the specific gravity of Mercury, that of the atmospheric air, at 0° C. and under the normal pressure being taken as unity. Taking 13.59593* as the specific gravity of Mercury, and 0.001290445† as

* Regnault, in Poggendorff's Annalen Vol. LXXIV. 1849.

† The weight of 1 Litre atmospheric air in Latitude ϕ and the height a above the sea level is

$$1.\ \text{grm}\ 292753 \frac{1 - 0.0025935 \cos 2\phi.}{1 + \frac{2a}{R}}$$

From Regnault's determination, Poggendorff's Annalen Vol. XCVIII. page 178. The latitude of Calcutta is 22° 33′, and that of Parisnath hill 23° 57′ 37″. Taking the mean of both, 23° 15′ and neglecting the correction for the elevation above the sea level, which is only 18 feet at Calcutta, the weight of 1 Litre air at the latitude 23° 15′ will be 1. grm 290445; Log. = 0.1107395.

that of the air, in the latitude 23° 15′, both being compared with water, we obtain the value of $p = 10535.8$ ($\text{Log } p = 4.0226694.$) If the height of a column of air $H = 1$, then the height of a column of Mercury of the same weight and of an equal basis is $\frac{1}{p}$;

α has the same value as in the last equation ($\text{Log. } \alpha = 2.4359260$)

t stands for the real mean temperature of the air.

b stands for the mean barometrical pressure between the stations.

B is the normal barometrical pressure at 0° C. $B = 29.9218$.

If we put $\frac{H\,\alpha}{p\,B} = A$, the equation becomes

$$S = A \frac{1}{\alpha + t} b$$

and introducing the numerical values we find $A = 41.95234$ (Log. $A = 1.6227562$).

The values for t were taken from the table of real mean temperatures. The mean pressures (b) were found by taking the pressure at the lower station as the first, and the pressure at the upper station as the last term of a geometrical progression, and the height in feet as the number of terms. The sum of all terms, divided by the height in feet would approach the mean pressure sufficiently near for our purpose.* To obtain the sums, it was necessary first to find the common ratio, r, of the progression of each separate hour. In the Appendix I have given the Logarithms of the hourly values of r as also the values of $r - 1$, and the resulting mean pressures.

The final coincidence of the results of the calculation of S by means of this formula, with the observed barometrical differences, will depend on the correctness of the determination of H, t and b.

* I have, in calculating the mean barometrical pressures, neglected to reduce the height of the barometer at the upper station to the gravity at the level of Calcutta. The correction would alter the mean pressure so little (less than 0.001 inch) that it would form only an insignificant part of the error, which, as I have ascertained, must be allowed in the value obtained by the method I employed, amounting to about $\pm$ 0.005 inches. The correction would have no appreciable effect on the value of S.

I will now assume the value found for each of these quantities to be nearly correct and will consider the magnitude of the error which would be caused by smaller deviations from the truth in each.

In doing this, an error in the height cannot be considered separately as it would alter at the same time the values of t and b. A variation in the height would change the value of the real mean temperature in the same direction, but in a greater proportion.

The influence of this error upon the value of H $\frac{\alpha}{\alpha + t}$, or the volume of the air, reduced to 0° C., would in the present case be very slight. The alteration in A for $\pm$ 10 feet would be $\pm$ 0.1. The value of the mean pressure cannot be obtained nearer than within about $\pm$ 0.005 inches. It would generally, the pressures remaining unaltered, for a greater height become a little smaller and for a smaller height greater and thus partly compensate the error in the temperature, the difference only of both appearing in the final result. In the present case, the effect of both, for a difference of $\pm$ 10 feet would cause a variation in the value of S, amounting to about $\pm$ 0.002 inches or less. An error in the barometrical readings at either station would tend to produce similar irregularities in the computed hourly variations of the weight, as have been found in the observed barometrical differences.

If my assumptions regarding the correctness of the values which have been found for H., t and b are right, the foregoing considerations would lead us to expect, that the computed barometrical difference would not differ from those observed by more than a few thousandths of an inch.

This result will however be modified by the presence of moisture in the air, which I have hitherto neglected, and which would alter the specific gravity of the air and therefore the value of p.

The computed values of the barometrical differences are given in Table VII. Column III. Corresponding as they do to the weight of a column of dry air, they are much higher than the observed weights in Column II. The deviations between the computed and observed values of S show very little variation, ranging between 0.028 and 0.031 inches. In every other respect the computed values show exactly the same course as those observed. We shall see how far their deviation may be attributed to the moisture in the air.

Moisture.—Observations of the moisture on the hill had been made on the 2nd for the hours 9 h. 15 m., 10 h. 15 m., 5 and 6, and on the 3rd for the hours 9, 10, 2, 3, 4, 5, 6. The observations, and the tensions of moisture, computed for the hill and for Calcutta by August's formula, are given in the following table. The column headed with t gives the reading of the dry bulb, t — t′ the difference between the dry and wet bulb. The last column contains, only for the 3rd April, the means between the tensions at Calcutta and on the hill.

Table VIII.—Tension of Moisture.

Time.	Temple.			Calcutta.			Mean Tension. Inches.
2nd April.	t	t — t′	Tension. Inches.	t	t — t′	Tension. Inches.	
9 h. 15 m. A. M.	23.3	9 6	0.238	30 1	4.3	0.856	
10 h. 15 m. „	23.7	9.3	0.264	31.8	5.3	0.869	
4 h. 55 m. P. M.	26.9	10.5	0.311	35.6	10.8	0.609	
6 „	25.5	10.4	0.262	33.3	8.9	0.655	
3rd April.							
9 A. M.	24.2	10.2	0.203	30.1	3.3	0.941	0.572
10 h. 10 m.	25.2	10.0	0.242	31.9	4.2	0.972	0.607
2 P. M.	30.3	12 9	0.283	36.1	7.8	0.913	0.598
3 „	30.1	13.7	0.230	36.3	8.0	0.909	0.569
4 „	30.0	13.2	0.255	36.0	6.6	1.020	0.637
5 „	28.1	12.9	0.209	34 7	5 2	1 065	0.637
6 „	26.7	11.9	0.219	32.3	3.8	1.045	0.632

The regular course, which the tension of vapour during the dry months follows at Calcutta, is this: the tension is at a minimum between 5 and 7 A. M. or about sunrise, and attains a maximum at 9 or 10. It comes to a second minimum between 1 and 4 P. M. and reaches a second maximum between 6 and 8 in the evening. About this maximum the tension either oscillates for some hours or it begins at once to decrease again till sunrise. Figs. 9 and 10.

A general coincidence with this course can be traced in the few observations at Calcutta, on the 3rd, which are here recorded. The figure 7 in the plate gives the curve more complete.

With the tensions obtained on the third I have computed the values of S for air mixed with vapour, at the respective hours. Adapting the formula for that purpose, and taking 0.622 as the specific gravity of vapour, that of air of the same temperature and pressure being unity, it becomes

$$S = A \frac{1}{a + t} \left\{ b - 0.378\ e \right\}$$

where e stands for the mean tension of vapour between the two stations. The values for e were obtained by taking the arithmetical means of the tensions observed at the corresponding hours on the hill and at Calcutta. (Mean tension, Table VIII.)

An error of 0.04 or 0.05 inches in the value of e would produce a difference of about 0.003 inches in the resulting weight; but in the opposite direction to that of the error in the moisture.

Table IX. of barometrical differences for moist air on the 3rd.

Time.	S. Observed.	S. Calculated.	Deviation or error.
9 A. M.	3.876	3.873	— 0.003
10h. 10m.	3.873	3.869	— 0.004
2	3.837	3.836	— 0.001
3	3.839	3.838	— 0.001
4	3 843	3.838	— 0.005
5	3.844	3.840	— 0.004
6	3.846	3.842	— 0.004
Average, ..	..		— 0.003

The computed values of S are now closely approaching the observed values. The small differences still remaining are easily accounted for by the probable errors in the height and in the tensions of moisture. A series of experiments which I made for comparing the indications of the wet bulb, at temperatures from 28° to 31°, and with tensions from 0.3 to 0.8 inches, with those of Regnault's Dew point apparatus gave this result: the tensions obtained by August's formula were always higher than those derived from the direct observation of the Dew point. The difference was on an average 0.05 inches and varied from 0.006 to 0.08 inches. It was smallest with lower tensions and increased as they became greater. Regnault's formula gave still greater differences.

Assuming that the mean tensions in table VIII. each being the mean between a higher tension, at Calcutta, and a lower one on the hill, were on an average about 0.04 inches too high, the negative character of the error in the computed values of S, and its quantity, are at once explained.

The close correspondence, taking the moisture into account, of the computed values of S with the observed barometrical differences, allows a conclusion, that the quantities H., t and b, employed in their calculation could not have differed materially from their true values.*

It also assures us of the complete control we may, with good observations and a favorable state of the atmosphere, exert over the changes in the specific gravity of a stratum of air between two stations, appropriately situated, and their causes. The advantage of such a control, if its general applicability be once fairly established, as a means of testing and correcting meteorological observations of all kinds, is obvious.

I am well aware that conclusions, drawn from so small a number of observations, as in the present instance at my disposal, and results based upon quantities, which themselves require verification, have no claim to generality before they have been repeatedly confirmed. It is possible, if the height of the temple had been determined by better methods, than I could use, and if the determination of moisture had been more accurate than the method employed will

* As it may be of interest to know the influence which an alteration in the value of p would have upon the value of S, I give the results of table IX. as obtained if the old values of the specific gravity of mercury (13.598) and of air (0.0012991) are employed, which would make p = 10467.24.

Time.	S. Observed.	S. Calculated.	Deviation or error.
9 A. M.	3.876	3.899	0.023
10h. 10m.	3.873	3.894	0.021
2	3.837	3.861	0.024
3	3.839	3.363	0.024
4	3.843	3.863	0.020
5	3.844	3.865	0.021
6	3.846	3.867	0.021
Average, ..	..	..	0.022

admit of, that the results obtained by calculation might not have agreed quite so well, or quite in the same way, with the values observed, as they apparently did: but in all such cases, a deviation from expected results will teach us something new. My intention in discussing these observations in the manner I have done, having been less to establish a law from the conclusions arrived at, than to direct the attention of meteorologists to the advantage of corresponding observations between stations similarly situated as Parisnath hill and Calcutta, particularly in India, and to invite repetition; I shall be fully satisfied, if that object be gained.

In connexion with the latter part of the discussion, I beg permission to offer a few remarks regarding the action of the watery vapour mixed with the atmosphere.

I give in Fig. 6—8 the curves of the hourly tensions of moisture on the 2nd (6), 3rd (7) and a part of the 4th (8) of April at Calcutta, and in Fig. 13 a fragment of the same curve on the hill. Fig. 9 is the curve of the mean hourly tensions for the whole month of April, and Fig. 10 for the whole year at Calcutta; the Figs. 11 and 12 represent the curve for the month of April and the whole year of 1850 at Bombay. The Fig. 6 a — 13 a, give the hourly barometrical pressures for the same dates, and 6 b — 13 b, the curves of the so-called pressure of the dry air, that is, the curves which remain after deducting the hourly tensions of vapour (6 — 13) from the respective hourly barometric pressures (6 a — 13 a).

The tensions of Figs. 6, 7, 8, 9 and 13 were calculated from the observations, by August's formula; those of Fig. 10 were computed from the published monthly results of the Calcutta Observatory, which are obtained by the so-called Greenwich constants; the individual values are on an average about 0.018 inches lower than those obtained by August's formula, but the general course of the hourly variations remains the same. The tensions of Figs. 11 and 12 were taken from the Register of the Bombay Observatory, where Apjohn's formula is in use.*

* The readings of the barometer and tensions of moisture which served for the construction of the curves are given in the Appendix, with the exception of those of the monthly curves at Calcutta, which are published in the Society's Journal, and the curves of Bombay, which are also published.

Examining the barometrical curves 6 a — 13 a, separately, it will be seen, that the barometrical curves of the single days, 6 a, 7 a, 8 a, 13 a, show, within very small limits, the same turning points, the same general proportions, and preserve the same regularity in their gradual transition from one hour to the next, as the curves of the mean hourly pressures of the whole month (9 a, 11 a) and the whole year (10 a, 12 a). This uniform resemblance may be shown for every day in the year.

Turning now to those curves which represent the so-called pressure of the dry air (6 b — 13 b), we observe, that the regularity of the barometrical curves is at once broken, the moment we deduct the tension of moisture. The irregularity produced by this operation is, as might be expected from the nature of the hourly variations in the tensions of moisture, greater in the curve of a single day (6 b, 7 b, 8 b, 13 b,) than in that of a whole month (9 b, 11 b,) and it is still partially apparent in the curves of a whole year (10 b, 12 b.) The curves of dry pressure are not only dissimilar to the barometrical curves, but differ also amongst themselves. A correction of the possible error in the determination of the tensions of moisture, particularly for single days, would not remove the irregularity, as the error for all tensions is probably on the same side and the magnitude of its variation comparatively insignificant.

The mean hourly tensions of moisture show locally a certain periodic regularity, when the means of a larger number of days are taken. But the magnitude as well as the course of their hourly changes varies with the locality (9, 11) and with the seasons. Taking the curves of single days, they will frequently be found to be entirely dissimilar to the monthly and yearly means, and also unlike each other, and often abrupt in their transitions Figs. 6, 7, 8, 9, 10, 11, 12, 13. This is not astonishing, if we remember how little is required to effect sudden changes in the relative saturation of the watery vapour in the atmosphere. I may add that the hourly variations in the curve of tensions of single days are often much greater than the whole of the daily variation in the barometrical curve.

Returning again to the barometrical curves, we find, that they also slightly alter the magnitude of their daily variation with the locality and with the seasons, but the uniform regularity in the

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course of their hourly changes remains always the same. The succession of the hourly increase and decrease is always gradual, and never suddenly interrupted, as that of the moisture, and the turning points fall invariably upon nearly the same hours.

On comparing the regular course of the curve of the hourly barometrical pressures of single days with that of the so-called pressure of the dry atmosphere and considering that the change observed in the latter is produced by deducting the tension of moisture from the former, it would appear, that the daily course of the pressure of the dry atmosphere was naturally irregular, and that the vapour was always present in the exact quantity required to restore the uniformity of the barometrical curve. In fact, it would seem as if the supply of vapour was at all times and solely governed by the greater or smaller irregularity of the curve of the so-called pressure of the dry air.

Knowing the laws which regulate the supply of watery vapour, and knowing also how many accidental circumstances may alter the curve of its tension for single days, so as to make it entirely unlike its monthly or yearly mean, and observing at the same time that the curve of the hourly barometrical pressures never alters its shape for one single day, such a conclusion would, to say the least, appear very improbable.

Assuming, on the other hand, that the course of the pressure of the dry atmosphere were regular and uniform in itself, we should, from a knowledge of the frequently altered course of the moisture, expect to find this regularity disturbed by the casual admixture of more or less watery vapour. We see, however, that such is not the case in reality, the barometrical curve being quite independent of the changes in the tensions of moisture, and never irregular.

The process of obtaining the so-called pressure of the dry atmosphere by deducting the tension of vapour near the surface of the ground from the barometrical column is based upon the supposition, that the tension of vapour near the surface would, practically, not differ much from the tension which would be produced by the weight of the column of watery vapour, diffused through the whole height of the atmosphere, if it were separated from the latter, and sustained its own pressure. This would involve another assumption,

namely, that an addition of watery vapour to the air would not affect the equilibrium, or density of the latter, solely increasing the local pressure upon the mercurial column of the barometer.

From the above considerations it would appear, that this view, if allowed to approach the truth practically in the mean of a larger number of days, is hardly admissible if applied to single cases.

I will subject it to a further test by deducing with its assistance the weight of the dry air, at different hours, between Calcutta and Parisnath hill, and comparing the values which will be thus obtained with those derived by calculation.

The results obtained for S in the foregoing discussion, taking the watery vapour into account, agreed well enough with the observed barometrical differences, to justify a belief, that the quantities employed in their calculation, although subject to a certain amount of error, would not differ essentially from their true values.

Determining with the same quantities the individual weight of each, the dry air and the watery vapour in the composition of the barometrical difference, the sum of both will always be equal to the value of S as obtained by calculation.

These weights are contained in the following Table.

Table XI.—Weights of dry air and Watery Vapour.

3rd April.	Weight of Dry Air.		Weight of Vapour.		S. Calculated.	S. Observed.	Deviation or Error.
9 A. M.	3.823	+	0.050	=	3.873	3.876	— 0.003
10*	3.816	+	0.053	=	3.869	3.873	— 0.004
2 P. M.	3.784	+	0.052	=	3.836	3.837	— 0.001
3	3.789	+	0.049	=	3.838	3.839	— 0.001
4	3.783	+	0.055	=	3.838	3.843	— 0.005
5	3.785	+	0.055	=	3.840	3.844	— 0.004
6	3.787	+	0.055	=	3.842	3.846	— 0.004

According to this table the weight of the dry air between the stations, or the specific gravity of the air on the 3rd decreased towards the time of the greatest heat and oscillated between the hours 2 and 6 P. M. round a mean value, without having shown at that time a decided inclination to rise. The weight of the watery

* 10 h. 10 m.

vapour also decreased from 10 A. M. towards the time of the greatest heat and remained stationary between 4 and 6 P. M., following on the whole the course indicated by the mean tensions of moisture in table VIII.

The weight of the dry air, if determined on the assumption upon which the so-called pressure of the dry atmosphere is founded, will show a different result. If the Mass of the dry atmosphere be represented by the height of the barometrical column after deducting the tension of vapour at Calcutta, the same must be true for the hill, and the differences between the pressures of the dry air above and below must be equal to the weight of the dry air between the stations. These differences are given in the following table. Deducting them from the observed barometrical differences, the remaining quantities would represent the weight of the watery vapour between the stations.

Table XII.—The supposed weights of dry air and vapour.

3rd April.	Supposed Weight of dry Air.		Weight of Vapour.		S. Observed.
9 A. M.	3.138	+	0.738	=	3.876
10*	3.143	+	0.730	=	3.873
2 P. M.	3.207	+	0.630	=	3.837
3	3.160	+	0.679	=	3.839
4	3.078	+	0.765	=	3.843
5	2.988	+	0.856	=	3.844
6	3.020	+	0.826	=	3.846

According to these values, leaving the vapour altogether out of the question, the weight of the dry air between the stations, or the specific gravity of the air, would have increased at an enormous rate towards the time of the greatest heat, and diminished still more rapidly towards evening, a result which would be contrary to all scientific experience.

It is evident that the assumption upon which these results have been obtained, cannot represent the true nature of the case.

In endeavouring to reconcile these apparent contradictions between theory and experience, it seemed to me that the difficulty

* 10 h. 10 m.

of accounting for the absence of any visible effect of the great and irregular variations in the tension of vapour upon the daily barometrical curve might be obviated by applying the view which Bessel has developed in his paper on barometrical measurement of heights* with regard to the action of watery vapour. According to it, the watery vapour, so long as it is not saturated for the existing temperature, would in no way differ in its physical behaviour from a gas.

To explain more distinctly in what way the application of this view would obviate the difficulties I mentioned, I will make use of the following illustration.

Suppose Fig. 5, an upright hollow Cylinder, a, b, c, closed at the bottom, to be filled with a gas g, which I will suppose to be not acted upon by gravity. This gas shall be subject to a pressure, which is represented in the figure by the moveable weight p, resting on the gas, and closely fitting the cylinder like the piston of an air pump. In a state of equilibrium between the elastic force of the gas, and the weight it has to support, the gas fills the volume 2 V and exerts an elastic pressure, equal to the weight p. If now, through a stopcock B a quantity of another gas, g′, of a different density be introduced, which, under the pressure p would occupy the volume V, the weight p will be raised from b to c, and the space filled by the two gases will now be 3 V. Each of the two gases will be distributed equally throughout the space 3 V, and both together will exert the pressure p.

By the increase of volume, to which each of the gases has been subjected, their densities must have been diminished in proportion, that of the first gas g, being now one-third, and that of the second gas, g′, two-thirds less than what it was before. The pressure or elasticity of a gas, all other conditions remaining unchanged, will vary in the same proportion as its density, and consequently the elastic pressure of the first gas g, which was equal to p, will now only be $\frac{2}{3}$ p and that of the second gas, g′, only $\frac{1}{3}$ p, the sum of both being equal to p, the weight they have to support.

If we now deduct the elastic pressure of the gas g′ from the sum of the pressures of both gases, we shall not obtain the pressure

* Astronomische Nachrichten Nov. 356, 357. Taylor's Scientific Memoirs, Vol. II. 1841.

which the first gas, g, would have shown, if the other gas had never been introduced, but a smaller one.

The space between the marks a and b, which was at first only filled with the gas g contains now two gases, the quantity of the first having been diminished and replaced by a corresponding volume of the other. To express the process in one word, it may be said, that in the original space the second gas has displaced a part of the first, the pressure remaining the same.

Returning again to the original figure, if instead of the gas g′, a quantity of another gas, g″, be introduced, which, occupying the same volume, 2 V, as the gas g, exerts an elastic pressure, p′, which is smaller than p, then both gases, the volume remaining the same, would exert the pressure $p + p'$. But the weight they have to support being smaller, they will raise it until the volume they occupy will be to the original volume, 2 V, as $p + p' : p$, when equilibrium will again have been restored, the sum of their elastic pressures not exceeding p. The individual pressure of each gas would again be diminished in proportion with the alteration of its density.

Any circumscribed space in the lower part of the atmosphere, in which the circulation of the watery vapour principally takes place may be compared to the space filled by the first gas g, in the cylinder, and the moveable weight would then represent the weight of that height of the atmosphere which is pressing upon the circumscribing surface and which is balanced by the elastic pressure of the air. The third gas g″, of the same volume and smaller elastic pressure would be the watery vapour, which during the day is continually being supplied wherever water is present on the surface of the ground, or by currents of moist air.

The weight of the watery vapour itself must increase the weight of the whole atmosphere, but the variation in this addition in weight must be comparatively small, and may be neglected in applying the illustration, the greater part of the absolute quantity of watery vapour contained in the air being permanent and not subject to changes.

So long as the supply of watery vapour is equably and continuously kept up from a large surface, a state nearly approaching equilibrium must soon be established between the stratum containing the vapour and the remaining part of the atmosphere which presses

upon it. The lower stratum will expand and the tensions or elastic pressures of the air and the vapour in it will divide themselves, according to the proportion in which they are mixed, into the pressure which they have to support, whether that pressure be produced by the weight of dry air alone or of both air and vapour.

Deducting, in the lower stratum, the elastic pressure of one of its constituents from the whole pressure, the remaining quantity will not represent the Mass or weight of the entire column of the other constituent, but solely its local tension or elastic pressure.

When the equilibrium is locally disturbed by the watery vapour being supplied in irregular quantities, or withdrawn by condensation or the up-current, the tendency to restore it between the disturbed body of air and the surrounding masses must, owing to the elasticity of the medium, immediately come into play, and thus small inequalities between the elastic pressures of neighbouring masses of air, being distributed almost instantaneously over larger bodies, will not be felt upon the barometer.

In the locality where the disturbance takes place, consequently, the diminution or increase of watery vapour will only alter the respective proportions in which the elastic forces of both constituents of the atmosphere share in supporting the whole pressure, without sensibly altering the pressure itself.

In consequence of the expansion of a volume of dry air, dependent on an admixture of watery vapour with it, the density of the mass in the space which was originally occupied will be slightly diminished, as a part of the air is displaced and replaced by an equal volume of watery vapour, which is specifically lighter than air. This diminution will create in the moist air, independently of the endeavour to put its elastic pressure into equilibrium with that of the surrounding body already alluded to, a tendency to interchange its position with that of specifically heavier masses. Such an exchange cannot be accomplished in a moment, and is probably effected very slowly, if we remember that the transition between very dry and very moist air, laterally and in a vertical direction, must be gradual. The process must be particularly retarded, where large masses are concerned, and will not interfere with the more instantaneous equalisation of the elastic pressures.

If the view here developed be correct, this will in no way oppose the assumption that the mass of watery vapour contained in the atmosphere in a vertical direction is in most cases, on an average, proportionate to the tension found near the surface of the ground.

According to the foregoing, the mode in which the watery vapour chiefly affects the barometer must be two-fold: in the first place by its tension or elasticity, and secondly by its weight. The tension is found by the Hygrometer and its action has just been considered. The weight can only be determined accurately after finding the mean tension throughout the atmosphere, or within the limits of a space for which the weight is required. Directly a palpable effect of the changes in the weight during the daily period can hardly be observed, as its variation must be a very small part of the daily barometrical variation. I will, however, not omit to notice a circumstance which may perhaps partly be traced to this cause.

In the regular daily course which the hygrometric state of the air undergoes, the quantity of moisture is, as a general rule, found smallest at sunrise, when the temperature of the day has reached its minimum, and when the vapour contained in it is nearest to its point of saturation. This minimum of moisture is caused by the condensation of a part in the shape of dew and fog. The quantity of dew deposited varies with the nature of the surface,—being greater, where the ground is covered with vegetation than where it is bare, and varying for different kinds of soil. I have seen it in the month of February under a group of trees near Poonah, equal in its effects to a slight shower of rain, coming down from the leaves. Its daily quantity will be regulated besides, as well as that of the fog by the mean degree of saturation, the mean temperature of the day (the tension of saturated vapour at the mean temperature) and the daily range of temperature. In tropical climates, not far from the sea-coast, where the mean temperatures and the state of saturation in the different months change comparatively little, the influence of the daily range would probably the most prominent.

If a merely local diminution of the water suspended in the atmosphere, confined to a small space, such as for instance is caused by a shower of rain, is not always observed to effect a perceptible change in the barometrical column, this is easily accounted for by the instantaneous restoration of the equilibrium which must take effect as

the rain is falling. Widely spread and continuous falls of rain are generally accompanied with a falling or rising of the barometer, depending on other primary causes, which would screen from observation the similar or contrary effect of the rainfall. But a very slight diminution of pressure by condensation extending simultaneously over many degrees of longitude, and following the meridian as far as the sun rises and sets once every 24 hours, is much more likely to be felt, as it could not possibly be compensated for in a short space of time. Its effect, if not great, must be constant, and will be found in a smaller mean pressure during the night, than during the day.

The tropical regions, where the time of sunrise, about 6 in the morning, varies throughout the year at furthest about an hour and a half would be best adapted to show such a difference, if it is great enough to cause a visible depression of the barometrical column. I have before me the observations made in 1849 and 1850 at the Colaba Observatory in Bombay and those made at Calcutta Observatory in 1856. At Bombay the mean barometric pressure in the curve of the hourly means of every month will fall very nearly upon 6 A. M. and at Calcutta between 5 and 6 A. M. Including for the mean of the day the readings from 6 A. M. to 5 P. M. and for that of the night from 6 P. M. to 5 A. M. the pressure of the day always shows a slight excess over that of the night, as may be seen from the following table.

Table XIII.—*Excess of the barometric pressure during the day over that during the night. In Inches.*

Bombay.	Jan.	Feb.	March.	April.	May.	June.
1849	0.011	0.018	0.022	0.015	0.016	0.009
1850	0.012	0.016	0.019	0.019	0.021	0.011
Mean.	0.011	0.017	0.020	0.017	0.018	0.010
Calcutta. 1856	0.021	0.029	0.029	0.029	0.017	0.005

Bombay.	July.	August.	Sept.	Oct.	Nov.	Dec.	Year.
1849	0 007	0.008	0.014	0.007	0.009	0.011	0.012
1850	0.008	0.013	0.009	0.009	0.012	0.014	0.013
Mean.	0.007	0.010	0.012	0.008	0.010	0.012	0.012
Calcutta. 1856	0.003	0.006	0.015	0.015	0.009	0.017	0.015

This excess cannot be ascribed to an excess of the tension of moisture in the same direction. The mean tension of moisture of the night is, during the cold months equal to or slightly greater than that of the day.

In table XIV I have given the mean daily ranges of temperature for the same years and months.

Table XIV.—*Daily range of temperature in ° C.*

Bombay.	Jan.	Feb.	March.	April.	May.	June.
1849	7.4	6.7	6 5	6.1	5.2	2.9
1850	7.4	9.1	6.5	5.7	5.3	4.1
Mean.	7.4	7.9	6.5	5.9	5.2	3.5
Calcutta. 1856	9.3	9.8	7.8	7 5	6.0	3.7

Bombay.	July.	August.	Sept.	Oct.	Nov.	Dec.	Year.
1849	2.7	2.8	2.6	5.8	7.3	7.9	5.3
1850	2.8	3.5	4.0	5.8	7.8	7.3	5.6
Mean.	2.7	3.1	3.3	5.8	7.5	7.6	5.4
Calcutta. 1856	3.3	3.0	3.8	4.1	7.0	9.0	6.2

If their variation from month to month is not always proportionate to the variation in the excess of pressure, they show at least, that in those months for which the excess of the pressure of the day is smallest, June, July and August, during the rains, the range of temperature is also at a minimum, and increases, as the former, in the cold and hot seasons.

Supposing that the excess of barometrical pressure during the day be owing to the amount of daily precipitation by condensation, the average daily quantity of the latter would in round numbers correspond to about the following quantities of water:

Bombay 1849, 0.160 Inches.
1850, 0.180 „
Calcutta 1856, 0.200 „

which appears excessive, even for tropical climates; Bombay being situated on an Island, and Calcutta not far from the Sea, in a country largely intersected with canals and rivers, it is not impossible that the excess of the barometric pressure during the day time may partly be attributed to the difference between the quantities of evaporation during the day and during the night. Observations of the hygrometer at the sea level alone would not decide the question, as they are only of local importance. Here also simultaneous observations at some elevation above the sea level would be of great use in determining the hourly mean quantities of water contained in the atmosphere in a vertical direction.

It would be premature, at present to attempt a full explanation of the phenomenon which may, besides, depend on other causes, and is most likely connected with the regular daily variation of the height of the barometrical column. Further observations in different parts of the country would be required. A direct test of the share which the amount of daily precipitation by condensation and the quantity of evaporation have in producing the excess of barometrical pressure during the day would be found in accurate estimates of the average amount of dew and fog for every day in the year, and in determinations of the quantities of evaporation during the day and during the night.

APPENDIX.

Hours.	Barometrical Readings at Calcutta in English Inches, corrected for temperature.					Tensions of Moisture at Calcutta in English Inches.				Observed and substituted Barometrical readings on the Hill, corrected for temperature in Eng. Inches.				Interpolation of unobserved hours on the Hill.
	1st April.	2nd April.	3rd April.	4th April.	Year 1856.	2nd April.	3rd April.	4th April.	Year 1856.	1st April.	2nd April.	3rd April.	4th April.	
M.	29.825	29.793	29.756	29.755	29.791	0.921	0.962	0.982	0.799	..	25.925*	25.904*	25.886*	
1	822	790	752	751	780	868	943	987	794	..	915*	896*	880*	The readings for the hours at which no observations had been taken on the hill were derived by interpolating the barometric differences (b — b′) for those hours and deducting the values thus obtained from the barometrical readings observed at Calcutta.
2	818	779	737	738	770	862	920	984	790	..	903*	876*	865*	
3	814	775	725	732	761	843	898	982	785	..	895*	861*	856*	
4	814	769	729	740	764	811	844	977	781	..	884*	861*	861*	
5	830	776	749	752	768	781	849	983	778	..	886*	879*	871*	
6	850	801	771	778	788	750	852	968	778	25.963	909*	896*	894	
7	875	822	785	795	809	780	914	989	786	980	926*	907*	909	
8	900	855	816	811	821	810	936	995	794	26.009	963*	944	928	
9	913	880	837	831	843	841	941	979	799	032	995	961	952	
10	918	879	849	..	844	840	970	..	800	044	26.004	972	..	
11	902	870	836	..	830	643	983	..	797	040	002*	968	..	
N	880	846	816	..	807	570	1.001	..	795	021	25.996*	960	..	
1	842	816	781	..	779	555	0.981	..	791	006	976*	935	..	
2	806	774	740	..	754	579	913	..	790	25.973	952*	903	..	
3	787	744	712	..	736	584	909	..	785	951	919*	872	..	All readings marked with a star have been interpolated in this manner, vide page 8.
4	772	728	701	..	726	612	1.020	..	784	928	900*	856	..	
5	762	715	691	..	727	609	1.063	..	792	918*	884	849	..	
6	763	716	698	..	729	655	1.037	..	806	919*	885	852	..	
7	779	724	705	..	755	659	1.045	..	806	935*	891*	860	..	
8	796	746	726	..	777	643	0.984	..	802	950*	909*	872	..	
9	813	778	754	..	794	779	989	..	802	959*	936*	893	..	
10	823	781	770	..	802	974	995	..	795	965*	938*	907	..	
11	815	775	771	..	800	985	982	..	797	952*	927*	904*	..	

APPENDIX.

Values employed in the Calculation of the mean Barometric Pressures.

1st April.				3rd April.			
Time.	Log r.	r — 1	Mean Pressure. Inches.	Time.	Log r.	r — 1	Mean Pressure. Inches.
6 A. M.	— 0.000015000	— 0.00003455	27.859	6	....	....	....
7	15020	3459	27.884	7	....	....	....
8	14990	3452	27.912	8	— 0.000014975	— 0.00003449	27.829
9	14945	3442	27.921	9	14965	3447	27.845
10	14910	3434	27.936	10	14950	3443	27.856
11	14870	3425	27.922	11	14930	3439	27.845
Noon.	14850	3421	27.897	Noon.	14900	3432	27.830
1	14815	3413	27.861	1	14870	3425	27.807
2	14805	3410	27.835	2	14856	3422	27.767
3	14825	3415	27.816	3	14880	3427	27.740
4	14870	3425	27.793	4	14900	3432	27.729
				5	14910	3434	27.720
		4th April.		6	14915	3435	27.726
6 A. M.	— 0.000015030	— 0.00003461	27.790	7	14925	3437	27.732
7	15030	3461	27.804	8	14930	3439	27.751
8	15010	3457	27.815	9	14950	3443	27.770
9	14980	3450	27.844	10	14950	3443	27.784

Buddhism and Odinism,—their similitude; illustrated by Extracts from Professor Holmboe's Memoir on the "Traces de Buddhisme en Norvége."—By Bábu Rájendralál Mitra.

The obscurity in which the early history of India is enveloped, has led the antiquary to hope that some light may be cast upon it by the acquisition of monumental evidence. In that hope he has laboured with assiduous care on inscriptions, coins, ancient buildings and sepulchral mounds. He has met with relics which keep alive his hope, and induce further investigation, and he has clung to the expectation of one day finding enough to fill up the gap which has been left in the annals of the country by the poverty of its historic muse. Experience has taught him not to anticipate great results from any particular research, for the unremitting labour of days and months often brings him nothing better than a rude mouldering urn, or a simple heap of ashes; but he knows that little as such results are, they still add that little to our scanty stock of knowledge, and will in time accumulate, and be the means of elucidating much in connexion with the manners and customs of the ancient inhabitants of this land and their relation to other nations of antiquity.

The gleanings which have thus been brought together during the last fifty years in connexion with the history of Buddhism, are already considerable. The era of Sákya Siñha has been established on the most authentic testimony, and his biography is now nearly as well known as of any other individual who lived two thousand five hundred years ago. Viháras, chaityas and pillars point out the city of his birth, the places where he sojourned, the spot where he died, and the monuments that were erected on his mortal remains. The history of the religion he taught is being daily more and more developed, and the darkness which hung over the course that religion took in its spread over the different regions of Asia is well nigh dispelled.

Sir William Jones was the first who was struck by the similitude of the words Buddha and Odin, and others noticed the coincidence of their use in designating the fourth day of the week; but fifty years ago there was nothing but vague suspicion that in its onward

course, Buddhism had travelled across the bounds of Asia and gone on beyond the furthest limits of the European continent to the freezing isle of Iceland, or that Odinism was nothing more than a modification of the religion taught by the renowned prophet of Magadha. The fact, however, has now emerged from the region of crude conjectural speculation, and though not yet established as a positive antiquarian discovery, has an array of evidence in its favour, which will direct the course of subsequent inquiry and lead to a definite consequence. Professor Westergaard and others have shewn that the old Icelandic language bears a strong resemblance and, most probably, owes its origin to the Sanskrita, and the work, of which we propose to make this paper a brief summary, points out the relics which still exist both in Iceland and Scandinavia of the former predominance in those places of a religion akin to Buddhism.

It is much to be regretted that our enquiry into this subject has to be conducted under serious disadvantages. History in Scandinavia, until after the eleventh century, was as sterile as in India, and the reader of Pagan literature knows even less of the doctrines and usages of the Paganism which existed among the Northmen, than does the Puránic, with reference to the Hinduism of the middle ages. Of the doctrines and institutions of the religion of Odin we have little that can be used for historical purposes. They are vague and mystified, and evidently never formed the subject of the records (Eddas) which have been handed down to us. Nor are we more fortunate in the material remains of Odinism. The North is even more poor than the East in relics of temples, statues, emblems, images and symbols. The little, however, that are still available both of legends and antiquities, bear so strong a resemblance to Buddhist relics in India, that it would be bold indeed to declare that their similitude is the result of an accidental coincidence.

Buddhism is characterised as eminently spiritual and free from idolatry, so was the religion of the Germanic race from whom Odinism was taken into Norway. Tacitus says* that the Germans held that God is the Ruler over all; every other thing is subject to and obedient to him, ("regnator omnium Deus, cetera subjecta

* Chapter 35.

atque parentia,") ; and again in another place ;* "They do not think that they can confine God within walls, nor liken him to any form of the human face, as the greatness of the celestial bodies." Herodotus says, "the Getes (ancient Norwegians) were theists and held the tenets of the soul's immortality;"† and the Buddhists hold that these doctrines are intimately connected with their religion. The esoterics of Buddhism inculcate a trinity of Gods as supreme Arbitors of the universe; and Odinism doth the same. The Buddhists have their Buddha, Dharma and Sangha, and their counterparts appear among the Scandinavians as Odin, Thor and Frigga. Adam of Bremen, who lived about the middle of the 11th century, in describing the principal temple of Odin, says, "This nation has a most noble temple which is called Upsala, situated not far from Sictona or Birka. In this temple are statues of three gods entirely made of gold. The people worship them. Of them Thor the most powerful, occupies the floor in the centre, Woden and Fricco have places on the sides." This position of the Odinic Trinity is unmistakeably the same as that which the Buddhist trinity occupy to this day on the covers of Tibetan Manuscripts or on the Sanchi gateway. Nor are they different in their attributes. According to Grimm and other German writers, Odin, Woden and Goden were names of the Supreme divine power among the Germanic race, and Thor and Frygga were impersonations of Divine attributes. With the Buddhists, Buddha is Primitive Intelligence, and Dharma and Sangha its attributes.

Very little is known of the literature of Odinism, and of that little we have but an imperfect knowledge. From the Edda of Sæmund or that portion of it which is still extant, it would seem that the religious books of Odinism were divisible into three parts; the first or "Voluspa" referred to the creation and destruction of the earth, the doings of the gods and the futurity of the soul. The

* Chapter 9.

"Ceterum nec cohibere parietibus Deos, neque in ullam humani oris speciem assimilare ex magnitudine cœlestium arbitrantur."

† Tod's Rajasthan I. 63.

‡ "Nobilissimum illa gens templum habet quod Upsala dicitur, non longe positum a Sictona civitate vel Birka. In hoc templo, quod totum ex auro paratum est, statuas trium deorum veneratur populus, ita ut potentissimus eorum Thor in medio solum habeat triclinium, hinc et inde locum possident Woden et Fricco."

second or "Havamal" included the moral precepts; and the third was devoted to the magic powers of Odin. With the Buddhists, the division of their books is equally threefold: they too have their Sutra, Vinaya and Dharma, or fundamental principles, morals and metaphysics; and if we make a sufficient allowance for the altered physical condition and social states of the two races, the difference will be but slight.

Laing, in his translation of the Heimiskringla, after a careful examination of geneological data, deduces the date of Odin to be about the end of the third century before Christ. That would be nearly three centuries after the death of Buddha. But if we bear in mind that the Buddhist colonists to the West must have progressed but slowly, and many of them started from India even in the middle of the third century before Christ, in the reign of Asoka, and that in their translation from their Indian or Scythic homes to the banks of the Baltic, their religion suffered considerably in its purity, we will be at no loss to find the cause for the anachronism in question. To the same cause may be attributed the confusion that may be noticed in the name of Buddha. Gautama is his name elect, and this name is curiously enough reproduced in Norway as that of his son. This may be an accident. But the fact of the name being well known in two such distant places, is of itself a matter worthy of notice, and offers strong temptation to the enquiry, is Tuisto a Norwegian reproduction of the Buddhist Tusita?

In the Buddhist mythology, the greatest opponent to goodness is an immortal named Mára. He plays the same part as an adviser of evil that Satan does according to the Christian theologians. For years he tried to mislead S'ákya Siñha from his resolve to attain Buddhahood, and invariably stood in the way of all who attempted to excel in knowledge or religion. In his career of mischief he has travelled to Scandinavia, and without even much altering his name "still rides the modern Saxon in his sleep (nightmare) as he did the Yngling king Vanland."* He commanded a prominent position in the Odinic mythology, and was known exactly by the same appellation (Mara) and for the same disposition which has given him an infamous notoriety among the Buddhists.

* Laing's Sea Kings of Norway I. 92.

Col. Tod has noticed a number of curious analogies between the customs, habits, manners and belief of the Rajputs and the ancestors of the Northern Scythians; and these go a great way to shew that they could not have existed, unless we admit a community of origin. The worship of the sword, the reverence for the horse, the sacrifice of that animal as a religious obligation, were alike common both in India and Scandinavia. In Iceland, where the horse is not indigenous, there existed the same reverence for the sacrifice of that animal as it did among the Asiatic Scythians, and the early Christian fathers had to issue strict injunctions to restrain the people from indulging in that unchristian ritual.

The Indo-Scythians were an equestrian race, and unlike most other nations, used the horse both for the saddle and in the war-chariot. The charioteers were always the flower of their armies, and the heroes of the Mahábhárat and the Rámáyaṇa and even of the Vedas always appear in their chariots. Such was also the case with the Getes; they too centred their chief strength in the chariot. These analogies are, no doubt much more ancient than Buddhism, but the Hindus and the Scythians, by becoming Buddhists changed their code of theological belief, not their customs and their knowledge, and therefore they may be fairly taken, *ad valorem*, as proofs of a community of origin of the different races among whom they are found.

"In the last rites for the dead," says Tod, "comparison will yield proofs of original similarity. The funeral ceremonies of Scandinavia have distinguished the national eras; and the 'age of fire' and the 'age of hills,'* designated the periods when the warrior was committed to mother-earth or consumed on the pyre. Odin (Boodha) introduced the latter custom and the raising of tumuli over the ashes when the body was burned; as also the practice of the wife burning with her deceased lord. These manners were carried from Sacadwipa or Saca Scythia 'where the Gete,' says Herodotus 'was consumed on the pyre or burned alive with her lord.'"† It is not necessary to enquire whence the Buddhists obtained their practice of burning the dead and raising tumuli on their ashes; suffice it to say, that they have it from an early age, long before it was introduced

* Mallet's Northern Antiquities, chap. XII.

† Rajasthan I. p. 73.

into Scandinavia, and therefore it must follow that either the Buddhists gave the practice directly to the people of the North, or both must have received it from one common source, the plateau of central Asia—that officina gentium whence in the darkness of a time far beyond the limits of history, peoples and races have come forth to take possession of the earth.

That the former is the case appears probable from the fact of the practice in question having been carried to the North along with the religion of the Buddhists.

Monumental remains of the Odinists, whether in Scandinavia or elsewhere, may be described as consisting principally of megaliths and mounds. The former include a variety of structures from a single erect block of stone implanted on the road-side to the most complicated and cyclopean structures, such as the Stonehenge. They are found universally distributed from India to Scandinavia, and mark the progress of the Buddhists in their migrations to the North.

The monoliths of India such as the Sati stones and lats are reproduced in Western Europe in the "standing stones," so abundant in the Channel Islands, and so peculiar to the Druidical priests. The ortholiths and parallelliths or single and double rows of standing-stones, are equally common in both places, and alike devoted to ceremonial purposes. The next are the cycloliths or circles of erect distinct stones. They sometimes enclosed open spaces, where most probably the Druids performed their ceremonials, and sometimes surrounded cromlechs or temples. In Southern India, these are still abundant, and their full development gave rise to the colonnaded enclosures which surround the topes of central India. In the large tope of Sanchi, they are rough-hewn blocks surmounted by top stones.

Dolmens, cistvaens, cromlechs and peristaliths are not without their counterparts in India—and they were evidently devoted to the same purpose. Dr. Wise, late Secretary to the General Committee of Public Instruction, in an excellent paper on the subject published in the Transactions of the Royal Society of Edinburgh,* has collected a large number of instances in which "the general identity, in

* Vol. XXI. pt. II. p. 255.

idea and design," of the Celtic structures of Europe and the Buddhist relics of India, are most curiously illustrated, and from their study, the learned author was led to the inference "that races of Asiatics proceeded westward at different ages and established themselves along the shores of the Baltic and the Mediterranean seas, and part of the Atlantic ocean; along which they have left characteristic monuments which resemble those of their original country."*

The next source of evidence of the identity of the Buddhists and the Odinists are their tumuli or mounds, which, in their most primitive form, were cairns or burrows—small heaps of earth marking the spots where were deposited the dead or their ashes; and in their full development appeared as the Topes of India and the haugs or tumuli of North Western Europe. In idea and design, they bear even a greater similitude to each other, than do the megaliths. They are generally, though not invariably, sepulchral, and are always intended to record the memory or the acts of saints, or men distinguished for their superior knowledge of religion.

Professor Holmboe's object in the memoir under notice is to prove this similitude. With that view he has examined the topes with reference to their size, their design, their grandeur, their symbolism, their interior arrangements, and their accessories, and his work attests the zeal, industry and success with which he has achieved his purpose.

The first section of the work is devoted to the examination of the Topes as the memorials of saints or their actions. He says "according to the legends of the Buddhists, they had, several centuries before the commencement of our era, adopted the custom of raising large monuments for preserving the relics of Buddha and of his principal disciples; and sometimes for perpetuating the memory of some of his actions on the spots where they had happened.

"These edifices are generally of colossal proportions, and are constructed of stones or bricks on a basement which is sometimes formed of a regular quadrangular wall; and at other times of blocks of rough stones thrown together without any order. These are called in Sanskrit *stupa,* which strictly signifies "a heap," "a mound,"

* Vide passim the Madras Journal of Literature and Science, Vols. XIII. and XIV. pp. 47 and 77 et seq. respectively, and Cunningham's Bhilsa Topes.

or "a tumulus." This word has been altered and abridged, so that the people of Hindustan and Afghanistan now call these monuments *topes:* in Afghanistan they are also called *burj* or "towers." In Ceylon they are called *tupa;* but more frequently *dagoba,* a word altered from the Sanskrit *dhatugopa,* that is the receptacle of precious relics. In Tibet they bear the name of *chostin* or *chhodtin.*

"The following legend contains a description of the Stupa and may be taken as its beau idéal.

'At that time, in the presence of Bhagavat, (Buddha) in the middle of the assembly which was facing him, from the South, there arose a stupa of seven precious substances;* it was five hundred yojanas in height, and of a proportionate circumference. It was raised high in the air, and seemed as if suspended from the skies; it was handsome and pleasing to the sight, ornamented with five thousand balconies, and strewed over with flowers, embellished with many thousands of doors, with thousands of standards and flags, and surrounded with thousands of garlands made of precious stones; having a belt made of cotton cloths and little bells, and the whole was redolent to a great distance with the perfume of the sandal and of the leaves of the tamala. The line of umbrellas with which the edifice was surmounted reached the habitations of the gods.'†

"To this legend, which describes the idéal, we will add what Mr. Cunningham says of the real tope.

"The tope" says he, "is a solid hemispherical building, varying in grandeur from the great chaitya of Sanchi, which has a diameter of 106 feet, to the smallest at Bhojpur, the diameter of which is only six feet. The most ancient topes were simple hemispheres, as the great chaitya of Sanchi, which dates probably six centuries before the era of Jesus Christ. This was continued to the period of the Bhilsa topes which date from the end of the third century of our era. In these, the hemisphere is raised some feet (from the ground) on a plinth, by the addition of a cylindrical portion. The topes of the third class are found in Afghanistan, and are not older than the commencement of the Christian era. In them, the hemis-

* i. e. of gold, silver, lapis lazuli, emerald, rock crystal, red pearls (coral?) and diamonds.

† Lotus de la bonne loi, p. 145.

phere is considerably raised on a plinth. The last class, of which the Sarnath tope near Benares is a magnificent specimen, has a hemisphere raised to a height as great as the diameter of the tope."

* * * * * * *

"In the topes dedicated to the celestial Buddha nothing was deposited; but the divine spirit, which is light, was supposed to dwell in the interior, and this was proclaimed outside by a pair of eyes, placed opposite to each of the four sides, either at the base or the summit of the building. Thus in the great chaitya in the neighbourhood of Kathmandu in Nepal, which is dedicated to Sambhu or Svayambhunátha, the eyes are placed on the sides near the crown of the edifice; such is also the case in numerous chodtens (m-chhod r-ten) of Tibet, which are dedicated to the celestial Buddha, and distinguished from the Dung-tens (g-Dungr-Ten) which are erected to the honour of mortal Buddhas. The first name signifies an offering to the divinity, the last a receptacle for bones (g-Dung), that is to say a building containing the bones or relics of some one of the mortal Buddhas. In that case the eyes occupy a place near the base.

"These monuments were not used exclusively for the preservation of the remains and the memory of saints, but were sometimes used for those of kings, as M. Burnouf inform us. 'According to the traditions of the Buddhists of the South,' says he, 'the relics of Buddhas were not the only objects which were entitled to preservation in these large edifices (the stupas). I find on the subject a positive injunction in *Tupa vamsa pali:* 'a venerable tathágata, who is perfectly and completely a Buddha, has a right to a stupa; a PratchtchekaBuddha has a right to a stupa; an auditor of a tathágata has a right to a stupa; a chakkavatti Rájá has a right to a stupa.'

"As the legends of India attribute to Buddha, the origin of the stupas or topes, so does traditions of Norway attribute the origin of their haugs (or large artificial mounds) to Odin. The author of the History of the kings of Norway, Snorro Sturlason thus expresses himself on this subject:

"Odin established the same law in his land that had been in force in Asaland. Thus he established by law that all dead men should be burned, and their property laid with them upon the pile,

and the ashes be cast into the sea or buried in the earth. Thus, said he, every one will come to Valhalla with the riches he had with him upon the pile; and he would also enjoy whatever he himself had buried in the earth. For men of consequence a mound should be raised to their memory, and for all other warriors who had been distinguished for manhood, a standing stone; which custom remained long after Odin's time.'*

"Thus we have not only express statement that remains of the brave should be disposed in haugs, but history informs us that such was most frequently the case. Again, as the topes were the objects of veneration and adoration, so were the haugs in Scandinavia. There may be found traces of this respect even in later days in Norway, for there was a custom for a long time not to allow any body to fell trees or disturb the herbage in the neighbourhood of these edifices.

"The author of the work entitled the *Lalita Vistara*,† biographer of Gautama Buddha, says, that on his death, men of eight different countries disputed for his corpse, and the quarrel was not appeased until the body was divided among the combatants, of whom each raised a stupa on the portion he had got.

"Snorro relates an analogous occurrence in the History of Halfdan Swarte (or the black) king of a part of Norway. Here are his words:

"The people thought so much of him, that when his death was known, and his body was floated to Ringerige to bury it there, the people of most consequence from Raumarige, Westfold, and Hedemark, came to meet it. All desired to take the body with them to bury it in their own district, and they thought that those who got it would have good crops to expect. At last it was agreed to divide the body into four parts. The head was laid in a mound at Stein in Ringerige, and each of the others took his part home and laid it in a mound; and these have since been called 'Halfdan's mounds.'"‡

The Saga tradition, it will be perceived runs on all fours with the

* Apud Laing, vol. I. p. 223.

† The Lalita Vistara does not advert to this circumstance. M. Csoma de Körös noticed it in the Dulva. See his Essay on the Life of Sákya Siñha; Asiatic Researches, vol. XX. p. 315 et seq.

‡ Apud Laing, vol. I. p. 269.

description of the disposal of the remains of Buddha, as given in the Tibetan books, and although relating to circumstances which occurred at a very distant place, still affords an instance of a coincidence which cannot be altogether valueless in examining the relation of the two systems of religion.

"In the manner of treating the remains of the dead, the analogy is borne not only in burying the body and erecting topes thereon, but we find that in Scandinavia, the ashes of men of little importance were deposited in urns and buried under earth or thrown into the water, just as the Buddhists of Ceylon put the ashes of their dead into urns and deposite them under the earth, or as the Buddhists of Nepal, who throw the ashes of their dead into water" (p. 8.)

The second section of the work is devoted to shew the identity of the form of the haugs of Norway with the topes of India; and then follow in the next section a few hypotheses as to the symbolism of the tope; the most probable of which appear to be that they represent a bubble floating on the sea as emblematic of the vanity of the human body.

In the fourth section the author conveys an idea of the immense masses of materials that are brought together to give to these monuments an imposing appearance, by describing the size of some of the largest topes and haugs.

He says, "the Valdershaug at Valderöe, an island near the coast of Söndmör, a district in the diocese of Bergen, is nearly four hundred feet in circumference, and from 14 to 16 feet in perpendicular height. It appears to have been twice as high before.

"The *Aushaug* in the parish of Ulfsteen, diocese of Bergen, has a circumference of 450 feet, and a height of 32 feet. A haug at Vigeröe in the same diocese, has a circumference of 330 feet and a height of 24 feet. In the parish of Urland of the same diocese, there are several haugs, some of which are more than 400 feet in circumference. In the parish of Glopen of the same diocese, there is a haug having a circumference of more than 530 feet and a perpendicular height of 24 feet. In the parish of Yttre Holmedal of the same diocese, there are two haugs, one of which is 340 feet in circumference and 32 feet in height, and the other 400 feet in circumference and 16 to 18 feet in height.

"It should be remarked that the dimensions above given, have not been measured by instruments, but that the circumference was ascertained by a man walking round the ruins, and the height by a comparison with the height of man.

"We shall now measure a few of the most considerable topes in Asia. The *Manikyala tope*, between Attock and Lahore, is 310 to 320 feet in circumference, and, even to our days, has a height of 80 feet; it was considerably higher before.

"The *Amarávatí tope*, near the river Krishṉá, in the Guntoor Sircar, has a circumference of 500 feet, and a height, at present, of 16 feet only.

"The *Bhilsa tope*, in the neighbourhood of Sanchi, S. W. of Bundlekund, is 554 feet in circumference, and 120 feet in height. It was higher before.

"The *Abhayagiri Dagoba*, in Ceylon, at present has a height of 220 feet; but tradition says that at one time it had a height of 408 feet.

"The *Jaitavana Dagoba*, also in Ceylon, had, it is said, a height of 360 feet, and still contains a number of bricks which would, according to the calculation of Major Forbes, suffice for a wall six feet high, two feet broad, and 97 English miles in length (nearly 30 leagues French.)

"The topes of Afghanistan are rarely more than 150 feet in circumference, and their height is ordinarily 30 to 40 feet.

"The *Maháastupa*, also called *Sonnávali*, which Rájá Duchtagamani had erected near the ancient capital of Ceylon, is placed on a square terrace 180 feet on each side, and paved all over with flags of granite. The stupa itself is 120 feet in diameter and 189 feet in height."

Compared with Indian topes the haugs noticed by M. Holmboe appear to be wanting much in height. But they are not always quite so low. Professor Verelius, in his notes on the Harvrar Saga, adverts to 669 tumuli, of which three, near Gamle Upsala, are said to be three hundred and fifty paces in circumference, and the ascent to them on any side takes about seventy-five steps, which would give them a perpendicular height of more than ninety feet.

With reference to the construction of these monuments, M. Holmboe observes that while the Indian edifices are all built with

cement, those of Norway and Finmark shew no signs of any cement having been used in their construction.

In the interior of the tope as well as of the haug there is a quadrangular chamber formed of flags of stone, and placed generally on a level with the ground surrounding the monument, sometimes on a level with the upper surface of the basement, and sometimes higher up, but never below the level of the surrounding land.

As appendages to the topes and the haugs may be enumerated flags on the summit, pilasters on the sides, pillars around, pavements and ditches surrounding the tumuli, tanks and tombs in their vicinity, and cells of the officiating priests.

Flags were common to the monuments both of India and Norway; but of the other accessories, Norwegian monuments seem to have had less than those of India. Tanks and wells are invariably found in the neighbourhood of topes, because supplies of water were absolute necessities for ceremonial purposes among the Indian Buddhists; but in a country like Norway, where ablutions could not be generally enforced, they must necessarily be few. They are, however, not altogether wanting. At Vigeröe, near the coast of Söndmör in the diocese of Bergen, there is a large haug, having in its neighbourhood a rectangular excavation, 54 feet long, 40 feet broad, and 6 feet deep, the sides being regular and sloping. It is singular in appearance and attracts the attention of all who visit the locality. To account for its origin, it has been said that it was excavated to afford the necessary material for the erection of the haug; while others suppose it to be the foundation of a house; but both these hypotheses seem to be inconsistent with its regular shape and sloping sides, and we must therefore take it to be the remains of a tank. Similar excavations exist in the neighbourhood of haugs in the districts of Indre-Holmedal, Yttre-Holmedal, Sielöe and Tysnaes.* M. Ström† supposes that there existed at one time a subterranean

* "It is curious, that in the United States of America may be found artificial mounds, consisting of many layers of different materials and formed in the shape of cupolas, often having a tank in its vicinity (Transact. American Ethnological Society, Vol. III. p. 157). These mounds suggest the idea of a population proceeding from the Norwegians, who discovered America in the year 1000 of our era." Holmboe, p. 23.

† *Söndmörs Beskrivelse II. p.* 41.

passage from the excavation at Gamle Upsala to the haug in its neighbourhood: traces of such passages have been found under mounds and barrows in the north of England; and Indian antiquarians have suspected their existence under the topes of Ceylon and Central India. Mr. Masson notices them in the neighbourhood of Afghan topes.

Pilasters are not necessary adjuncts to topes: they occur on the cylindrical shafts of the topes of the second class, such as those of Afghanistan, and may be compared with a peculiar construction on the Kongshaug at Augvaldsnæs in the island of Karmöe. M. Holmboe describes it thus: "The sides of the haug are ornamented with a series of small cells or chambers open in the front, of which the intermediate spaces, at some distance, present the appearance of pilasters."*

Collonaded verandas round the central hemisphere are unknown in Norway. In India, they are noticable only in the most finished topes, such as those of Anurádhápur of Ceylon, and of Bhilsa and Afghanistan. Ranges of pillars of brick or stone, and wooden palisades are not uncommon around topes. They enclosed spaces which used, most probably, to be occupied by the congregation on days of public worship. In some topes two and even three ranges of palisades have been found.† They do not seem to have been very frequent around haugs, but around the boutrœhaug‡ (mound of the bou tree) there may be seen a range of stone shafts set up vertically which bear the closest analogy to the palisades in question. Around the great temple of Gamle Upsala, a wooden palisade is supposed to have existed, and we read in Scaldic poetry of a golden ring, or chain, or serpent, surrounding the temple of Odin which, it would be no great stretch of imagination, to reckon as the counter-

* Holmboe, p. 18.

† A fence similar to this has been noticed by Dr. Wise around a Hindu temple at Calna, belonging to the Rájá of Burdwan. In a neighbouring temple I was struck by the appearance of a stone figure which was represented to me as that of Vishṇu, but which bore the closest similitude to the Buddhist figures excavated by the late Major M. Kittoe from the ruins of Buddha Gaya.

‡ *Urda* 11, p. 325. I have no means of ascertaining the Norwegian meaning of the word *bou*, but its use in connexion with a haug suggests the idea of its similitude with the Buddhist "bo" being more than accidental.

part of the Indian palisades. In Burmah the fences of the *kiungs* are made of the tails of dragons and monsters whose heads ornament the sides of the gateway.

Small tombs in the neighbourhood of topes and haugs owe their origin to an idea of sanctity attached to these monuments, and the desire, so common in mankind, to place the remains of their relatives in or about places reputed to be holy. In Afghanistan these tombs differ from the topes in not having the cylindrical shaft which joins the hemisphere of the tope with the basement, and their contents being purely sepulchral in their character, consisting chiefly of bones, ashes and charcoal, and having none of the precious articles noticable in the topes. " They are placed generally, to the north, the south or the west of the tope, but never to the east." " In Scandinavia, it is not possible to distinguish, by their form, the tombs from the more sacred monuments, but from the groups of these mounds, it is to be supposed that the most sacred monuments are the largest; and when they are opened their contents in every instance are different.' *

The interior arrangement of the topes and haugs has been already observed to be generally the same, but in the topes of Darounta, in Afghanistan, Mr. Masson observed that " the whole mass of the structure is divided into four parts, by passages intersecting each other at right angles: the passages extend the entire depth of the building, and have a breadth of five or six feet or more. Inferior tumuli do not always exhibit this peculiarity of construction, which may nevertheless be deemed genuine, and possibly prescribed, being found in the more ancient monuments."† A similar construction is noticed in the mound raised over the remains of Frey king of Sweden, which had a door and three openings forming a cross.‡

We shall now notice the relic contents of the topes and haugs. M. Holmboe says, " the articles deposited in these monuments are very much alike." In the recesses of the topes occur finely powdered earth, sand, charcoal and ashes, preserved in vases of terra cotta, stone, gold, silver, copper or iron. In one instance a wooden vase has been found. Around the vases, and sometimes within them, occur ornaments of gold, silver and copper, precious stones, various resins, small bells, gold foil, glass and crystal cylinders, and bottles con-

* Holmboe, p. 23. † *Ariana Antiqua*, p. 923. ‡ Holmboe, p. 24.

taining a brown acrid fluid, and fragments of leaves and of bark written over with the Indo-Bactrian characters. The contents of haugs include finely powdered earth, brownish sand, ocherous earth, and vases or urns of stone, iron, copper and wood, but rarely of glass, gold* or silver; containing gold coins, fragments of bones, ashes, ornaments, and of gold, silver or bronze. Various resinous and fatty matters, ingots and foils of gold, pearls, fragments of wood and bark, once a bit of birch wood, once a glass vase containing a brown rancid fluid, and at another time a glass phial containing traces of a fluid, have also been observed among the contents of haugs. Among the articles most common in topes are earthen lamps, which seem to have formed one of the principal offerings with the Buddhists to the manes of their ancestors. They have never been met with in the haugs, where their place is supplied by fragments of swords and spears. "This difference is owing, no doubt, to the bellicose propensity of the people among whom the haugs were erected." The coins found in the haugs are inferior in execution to those found in the topes, but they bear a strong resemblance to the mintage of Azes and of his successors, which have been found in abundance in the topes of Afghanistan.

Buddhist coins have generally a mystic cross *(swastika)* imprinted on them. The emblem is held in high veneration, and the Hindus have adopted it "to give to their coins, inscriptions and ceremonials a sign of benediction and happy augury," although they have no distinct conception of the manner in which it is to produce the beneficial results they seek. In the Bracteates found in Scandinavia, whether within haugs or elsewhere, we find this mystic symbol reproduced in all its entirety; and ancient sepulchral stones found in the cemetery at Gjerde in the parish of Etne, diocese of Bergen, and at Suède in the parish of Skeftuna, province of Upland, shew it with but slight variation. M. Mionnet notices this cross as a monogram of ancient Gaul, where it must have travelled with the religion of Odin before the advent of Jesus Christ.

It is uncertain if the phallic worship had ever been transported to Scandinavia, but some sacred stones found in haugs admit of a very close comparison with the *linga* of India; and the *jarkanasteen* has

* Many gold vases are said to have been found in Denmark.

been supposed to be an imitation of the Vaishṇavite *ṣalígrám.* After adverting to these, M. Holmboe dwells at some length on the peculiar veneration with which the Buddhists and the Odinists hold the adoration of trees. The Bo tree of India is the prototype of the birch of Scandinavia, and we find them both as unfailing attendants of topes and haugs and equally the objects of almost divine veneration.

In the neighbourhood of topes may be noticed a large number of cells or caves which formed the dwellings of the officiating priests, who from their vicinity, in the palmy days of Buddhism in India, chanted forth their adoration to Primeval Intelligence Adi Buddha. Their counterparts are not quite so abundant in Scandinavia. Dwelling-houses there were generally built of wood and other easily perishable materials, which cannot be expected to leave traces behind them after the decay of centuries. We nevertheless find there remains of houses and caves, whose situation indicates that they must have been attached to some sacred monument. The cells around the Oushaug has been already adverted to. From them a road six feet broad and a hundred feet long, leads to two houses which most likely were at one time the domiciles of priests. A number of caverns have been noticed by Bishop Newmann in the diocese of Bergen,—a place which seems to have been at one time the head quarters of Odinism in Norway.

* " Dragons or imaginary serpents having limbs of different animals and even of man, play a prominent part in the mythology and the ornamental arts of the ancient Scandinavians. They may be seen on their Bracteates of gold and on divers ornaments of gold and silver. Even after the introduction of the Christian religion, sculptors transported figures of dragons on their household goods and on a large number of sepulchral stones ; and the walls and the doors of our ancient churches had no commoner ornament than interlaced dragons.

" The serpent does not occupy a remarkable place among the animals of Scandinavia ; it becomes difficult, therefore, to explain how it came to enjoy that high position on their monuments, unless we suppose it to have been borrowed from some country where it attracts a large share of attention, as is the case in

* Holmboe, p. 58.

India, which abounds in serpents, the most dangerous on account of their poison, their size, and their force. As a consequence of this abundance, the ancient legends of India are full of narrations about dragons endowed with extraordinary qualities. (According to those legends) they speak, they reason, they are their princes and princesses, they perform miracles, they unite with men in marriages, &c. &c. The Biographer of Hiouen Thsang makes mention of tanks peopled with dragons in the neighbourhood of topes; and these dragons are so pious that having metamorphosed themselves into men, they respectfully circumambulate the topes or *stupas.* The same biographer informs us that the Buddhists figured dragons on their sculptures; he mentions for example a convent at Pataliputra which had pavilions with pillars ornamented with dragons.* Among the ruins of other Buddhist towns we often find sculptures representing serpents and lizards.† In the cell of a dagoba, opened in 1820, near Columbo in Ceylon, there were found, among other ordinary articles, clay images of serpents called the *cobra di capello.*‡ The same taste for sculptures in wood representing interlaced figures which was in vogue in Norway during the middle ages, may now be seen in the Buddhist kingdom of Nepal; and we thus find at Kathmandu, the capital, near the approach of a bridge a gateway having over it a kind of coat of arms supported by two serpents."§

M. Holmboe devotes the seventeenth section of his work to the examination of a class of long narrow mounds peculiar to Tibet and Scandinavia. Dr. Thomson, in his travels in the Himalaya, noticed one of these near Leh, in the province of Ladak, which was nearly half a mile in length. "It consists," he says, "of two parallel walls, twelve or fifteen feet apart, and nearly six feet high, the intervals between which are filled up with stones and rubbish, and the whole covered with a sloping roof. * * * On the roof are laid large slabs of slate every one of which is covered with Tibetan letters, and more rarely with a rude design of a temple."|| The height

* Hiouen Thsang, 128—51.

† Sirr II. p. 332. Ritter, *die Stupa's*, p. 210. Forbes I. p. 415—16.

‡ *Ib.* 90—91.

§ Egerton I. p. 189—190.

|| Thomson's *Himalaya and Tibet*, p. 183.

and the breadth of these constructions are generally very much alike, but the length varies from a few feet to near half a mile. The characters represent the mystic formula *Om mani padme hum* repeated a number of times, and the construction itself is called after the second word of the formula a *Mani.* In Scandinavia these constructions have undergone but little change. In their height and breadth they are alike, and in length they vary just as much as the Tibetan Manis. Their roofs have suffered much from decay, and, in many instances, are altogether gone; and they have no inscriptions.

In the eighteenth section M. Holmboe passes on from relics to historical testimony to "prove the birth of Odinism in the bosom of Buddhism." He avails himself of the opinion started by Snorro that on the fall of Mithridates, Odin and his followers proceeded northwards from Asia to escape the Roman yoke, and that on reaching Scandinavia they supplanted the Celts who had before them taken the country from the Mongols—a race whom we now recognize in the Laplander, the Samœid and the Esquimaux. He says,*—

"The father of Norwegian history Snorro Sturlason, after having pointed out Tanaqvisl (Tanais on the Don) as the frontier between Europe and Asia, continues in these words:—

"'The country east of the Tanaqvisl was called *Asaland* (the country of Ases) or *Asaheim* (the home or native land of Ases), and the chief city in that land was called Asgard (the city of Ases). In that city was a chief called Odin, and it was a great place for sacrifice.'†

"A little after he says; 'There goes a great mountain barrier from North-east to South-west, which divides the great Svithiod from other kingdoms. South of this mountain ridge it is not far to Turkland, where Odin had great possessions.'‡ The great mountain barrier mentioned is the Caucasus, for he has said before that Svithiod was situated to the North of the Black Sea; and by the country of the Turks he alludes evidently to the country which at present bears the name of Turkistan, for he says subsequently that Odin, quitting his native home with his companions, proceeded on towards the West and arrived in Gardarike (Russia).

* Holmboe, p. 63, et seq. † *Ynglinga Saga,* Chap. II. ‡ Id. Chap. V.

"Having thus demonstrated that Snorro places the birth-place of the Ases in Turkistan, we see that Chinese, Greek and Latin writers speak of a people or of a race of Ases in the same regions. A Chinese author mentions that, in the second century before Jesus Christ, there arrived at Lo-Jang, capital of China, a Saman* of the race of Ases, who lived on the banks of the river Oxus, and who had translated the holy book which he had brought with him, and which led to the conversion of a large portion of mankind to Buddhism.† Strabo‡ says that, among the people who, issuing forth from beyond the banks of the Jaxartes, invaded Bactria and snatched the possessions of Alexander's successors, the most distinguished were called the (Ασιοι) Asioi. Trogus Pompeius makes mention of the same circumstance in these words 'Sarancæ et *Asiani* Bactra occupavere,' and in another place, he calls "reges Tocharorum Asiani,"§ expressions which led M. Lassen to start the opinion that the Asii or Asiani were not the same people, but tribes of a distinguished race, from whom the kings of Tochares deduce their origin.‖ This hypothesis acquires some appearance of truth, if we suppose that it is the same name which we read on the coins with the legend ΒΑΣΙΛΕΩΣ ΒΑΣΙΛΕΩΝ ΜΕΓΑΛΟΥ ΑΖΟΥ. A great number of these coins were discovered in the topes; and they have been found elsewhere, particularly to the North and East of Peshawur, in much larger quantities than any other variety. It is worthy of remark that the coins of Azes present a greater number of types than those of any other sovereign whose coins have been found in the topes; a reason which led Mr. Wilson to suppose that they are not to be attributed to one single king, but to Azes and several of his successors who flourished in the first century before Christ and laterally.¶ The hypothesis of M. Lassen is supported by Jornandes, who says, Gothi *proceres* suos *anses*, i. e. semideos voca-

* "Saman or rather Cramaṇa, "ascetics who have subdued their senses," is a term which designates the Buddhist clergy."

† *Zeitschrift f. d. k. de Morgenl.* III. p. 121—123.

‡ Strabo I. XI. 8, 2, (p. 511).

§ Trog. Pomp. XLI. XLII.

‖ *Indische Alterthumskunde*, II. p. 360.

¶ *Ariana Antiqua*, p. 320, et seq.

vere." Now the word *ans* of the Gothic language is identical with the *ás* of the ancient language of Norway.*

"It is probably the same dynasty of which the Chinese annals make mention when they say that in the first century after Christ the prince of Kuei-Chuang, conquered all the country of the Amszus around Kabul, Kandahar and Kophen.† The same annals speak, in another place, of a people or a dynasty of *Amsi* in Soghdiana, in the first century before Christ.‡

"I hope I have now produced satisfactory arguments to prove that the Asaland of Snorro is identical with the country of the Azes, of which we have spoken above. We shall now demonstrate that Buddhism had extended into those countries in less than two centuries before Christ, and continued to be professed for several centuries after that period.

"The first powerful sovereign who embraced Buddhism was the king of India, Asoka, who reigned in the third century before Christ; and to record that event he erected pillars and large blocks of stone with inscriptions mentioning the adoption of that religion. One of these blocks has been discovered in Kabulistan. This monarch sent envoys to the Greek kings of Syria and Egypt, to obtain their permission to preach Buddhism in their dominions.

"The Chinese annals record that in the second century before our era, their general Hukiuping, when carrying on a war against the Hiungnus, met at the king of Hin-thia, to the West of the mountains of Yarkand, a gilt statue to which offerings were made;§ and the commentators of the Chinese historian Pan-ku declare that that statue was of Buddha.|| I have already shewn from those annals that in

* When the vowel *a* receives the long accent (á), in the Norwegian language, it is pronounced as *au* or *ao*, and often corresponds with the syllable *án* in the cognate languages; for *example* Sanskrit *hansa;* German, *gans;* Norwegian, *gás* "goose." The Norwegian *as* and the Gothic, *ans*, are undoubtedly derived from the Sanskrit, *ansu*, a "ray," "light," "splendour," and consequently *ansi* or *asi* means splendid, a very convenient epithet for a distinguished family.

† *Foe Koue Ki, p.* 83.

‡ A. Remusat, *Nouv. Melanges*, t. I. p. 175.

§ Lassen's *Indische Alterth.* II. p. 54.

|| *Journal des Savants*, 1854, *p.* 280.

the second century before Jesus Christ, a Buddhist priest arrived from the banks of the Oxus to China, and converted a large number of men.

"About the end of the fourth century, the Chinese pilgrim Fa-Hian proceeded towards the West, in company of some of his countrymen to search, in the words of his historian, *for the precepts of the Law,* that is to say, to learn the precepts of Buddha in the countries where he had preached them for the first time. In the course of his travels he arrived at the town of Khoten, and found that the religion of Buddha was professed there with great zeal; there were a large number of spacious and magnificent convents, some of which contained thousands of the clergy; they possessed precious images of Buddha, which they used to take about during their numerous processions, in which even their kings took a part.* After leaving Khoten he pursued his travels towards the West, and traversed the countries which we have seen to have been inhabited by the Azes, and met a number of his co-religionists.

"Another Buddhist pilgrim of China, Hiouen Thsang by name, undertook a peregrination in the seventh century with the same object as Fa Hian, that is to say, to study the doctrine of Buddha in the countries where he had preached it himself. He passed through the whole of Higher Asia as far as Bamian, among the mountains to the North of Kabulistan, and found that place to be a thriving centre of Buddhism.

"One may form some idea of the flourishing state of Buddhism in these places when he is told that the kings of Lassa in Tibet, in the seventh century, sent to the valley of Kabul for architects to erect Buddhist temples.† We see now that Buddhism flourished in those countries before the period when Odin forsook his native land to establish himself among the ancestors of the Scandinavians, and the topes attest that the profession of Buddhism was continued for several centuries.

"The true situation of *Asgárd* will no doubt remain unknown

* *Foe Koue Ki* and *l'Histoire de la Ville de Khoten,* traduit du Chinois par A. Remusat, Paris 1820.

† Sanang Seetsen, *Geschichte der Ost Mongolen von I* Schmidt, St. Petersburgh 1829; Abschan II. *Tibelische Geschichte,* p. 41.

until the epoch of Odin's emigration is thoroughly ascertained. It appears to me that the name Asgárd is identical with *Asagarta* of the Bisóutoün (Bagistana) inscription, which in the enumeration of the provinces which belonged to the monarchy of Darius is named immediately above Parthia. M. Lassen thinks that we should search for Asagarta to the West of Parthia. If, on the contrary it be situated to the East of that country, the situation will accord better with the countries which we have found as those of Azes. Asgárd is perhaps an oriental name slightly altered to confirm to the rules of the Norwegian language. The words *gard*, *guer*, *kart*, *kert* are met with in most Arian languages, with the same signification which *gárd* has in the Norwegian, for instance in Persian Darabguerd means the town of Darius."

Allusion has already been made to the similitude of the words Buddha and Odin. M. Holmboe says that "the arguments both for and against the identity of the two words are too weak to lead to a conviction." He adds, however, that "it is to be presumed that the most illustrious of the missionaries who proceeded to the North must have borne the name of Buddha or at least some epithet derived from the Sanskrit root *budh* "Intelligence," "knowledge," for example *bodhan*,* or *bodhant*, participle present of the verb; and from that the Scandinavians may have formed their *Odin* and the Germans their *Wodan*. The transition of the letter *b* to *v* still occurs in the Sanskrit itself, and in the Hindustani and Bengali which are derived from it, the difference is entirely lost. The omission of the first letter in the name of Odin is conformable to the rules of the ancient language of Norway, in which *v* is often elided before the labial vowels *o* and *u*. The German appellation Wodan accords more with the nominative masculine of the present participle *bodhan*, and this accordance becomes the more striking when it is considered that in a glossary on the work of Jonas de Bobbio, this word is written *Vuotant*;† thus answering for the oblique cases of the participle present

* The form *Bodhin* enters at least in the name of the sacred tree, which is sometimes called *Bodhin Wahanoa*. Ritter, *die Stupa's* p. 161, Forbes p. 213.

† Gimm *Deutsch. Mythologie* 2te Ausg, p. 120.

Several conjectures have been proposed about the derivation of the name Oden or Wodan: for example from the Gothic *Wods* or Norwegian *Odr*, "enraged," or,

of *bodhant.* The hypothesis about the identity of the name of Odin with Buddha or with some word derived from that root, is likewise proved by the name of Wednesday, which, in Scandinavia bears the name of *Onsdag*, a contraction for *Odins-dag* "the day of Odin," as in Sanskrit *Buddhavára* "the day of Buddha," and in Hindustani, *budh-bar.*

"It may perhaps be objected to this identification that, in the annals of Norway, Odin is represented as a warrior and not as a preacher, and that the warlike life of the worshippers of Odin little accords with the mild and pacific doctrines of the Buddhists. But we find from the fragments of swords in religious places that such an alliance in the beginning of Buddhism was not very astonishing; and, on the other side, it must be remembered that the Buddhic religion has its esoterics very different from its exoterics, and that according to the Chinese annals, the people of the North accepted only the last, i. e., the morality and mythology, as they were the most conformable to their nomadic habits and warlike propensities.* The circumstance, lastly, that not only Odin himself but several other Azeses' having been elevated to the rank of gods, justifies the supposition I make that they enjoyed a religious veneration during their existence. Odin was probably, as Buddha, placed at first among the inferior gods, and subsequently among the superior gods, until at last he was recognized as their chief. That which evidently proves that a long time passed before Odin attained the supreme rank is the fact, remarked by Adam of Bremen, that in the temple of Upsala the image of Thor occupied the place of honor in the centre between Odin and Fey."†

as suggested by Grimm, from the Old German *Watan* or Norwegian *Vada* "go and walk."

* *Foe Koue Ki* p.12. The biographer of Hiouen Thsang likewise speaks frequently of *warlike* Buddhists; thus at page 278, after mentioning that the people of Khoten profess a great respect for the law of Buddha, he adds: "The king is brave, prudent, *warlike*, and full of respect and affection for virtuous men." Again at page 382, it is said of the king of Ho-tan (Khoten): "The king is very *warlike*, and bears a profound respect for the law of Buddha."

† Grimm. *Deutsch Mythologie 2te Augs.* 146.

PROCEEDINGS

OF THE

ASIATIC SOCIETY OF BENGAL,

For November, 1857.

The monthly general meeting for November was held on the 4th instant.

The Hon'ble Sir J. Colvile, Kt., President, in the chair.

The proceedings of the October meeting were read and confirmed.

A presentation was received from the Royal Observatory, Greenwich, of a copy of "Tables de la Science, construites d' apuis le Principe Newtonien de la Gravitation Universelles," by P. H. Hassen.

The appointment of Captain C. H. Dickens and Mr. Cowell as members of the Council, in the room of Dr. Spilsbury and Archdeacon Pratt, was confirmed.

The election of Mons. Robert Schlagintweit as a corresponding member of the Society, was again postponed, under rule 6 of the Society's Bye-laws.

A note from Captain Haughton, withdrawing from the Society, was recorded.

Communications were received.—1. From Mr. H. Piddington, a paper on the spontaneous combustion of Coal.

2.—From Mr. B. H. Hodgson, C. S., a description of a new species of Himalayan Mole—*Talpa microura.*

3.—From the same gentleman, a series of Vocabularies, &c., as named in the following extract from his letter, dated 9th October last.

"I am sending you by post through the Bengal Secretary, A. R. Young, Esq., four big letters, containing two series of Vocabularies, each in two parts, being, 1st those of the broken tribes of the

Central Himalaya, and 2nd, the dialects of the Great Kiranti language, and further, an ample and careful dissection of one of the former class of languages. These will in a few days be followed by a similar dissection of one of the above dialects of the Kiranti tongue. All these tongues are of high interest, as I think will be sufficiently apparent from the grammatical analysis of one of each group, viz., the Vaya tongue of the former, and the Baking of the latter class, and I think Müller and Caldwell will be now satisfied that they were very premature in asserting that there is nothing Dravidian in the Himalayan tongues.

"The Vocabularies were prepared long ago, and ought to have been sent, but when I got into the work of grammar analysing, I of course saw faults in the first crude work, and those I purposed to correct ere the Vocabularies were printed, but life is short, science long, and I must be content to leave the Vocabularies as they are, while I go on with my complete examination of such few of the whole of these tongues as seem to me most important in themselves and most likely to illustrate the class they belong to; I wish I could have had a little more time both for vocabulary and for complete analysis."

4.—From Lieut.-Col. R. Strachey, Secretary to Government, Central Provinces, the following account of the old Fort of Bilheree near Jubbulpore, by Capt. D. C. Vanrenen, Arty.

A description of the old Fort of Bilheree, situated about 56 *miles N. N. West of Jubbulpore, which was destroyed in the month of August,* 1857, *by Captain Vanrenen of the Artillery, by order of Major Erskine, Commissioner, Saugor Division.*

The old Fort of Bilheree, which was built by Luchmun Singh Pudhae Chutree in A. D. 1489, consisted of a square redoubt with a side of 234 feet and circular projecting towers at each corner, their diameter being 14 feet, and octangular bastions, one on each side of the principle gateway. A high wall to the north, of irregular outline, with corner towers, which following the line of an impassable swamp, was connected to the main work by a curtain wall, at the north west corner. It was bounded on the North and East

by an unfordable tank and swamp, and save a small clear space in front of the principal gateway, it was further protected both on the West and South by a deep ditch, its average depth being 12 feet and breadth nearly 30 feet.

The walls of the square redoubt, were about 40 feet high, and $4\frac{1}{2}$ feet thick, the bastions being 10 feet higher, and the whole was carefully loopholed for musketry fire. The fire through these loopholes was obtained from the roof of a line of buildings, or verandah, open at the rear. This banquet was of great solidity, being supported on cut stone pillars. Single stone slabs spanned these pillars, which were faced with lime cement.

The northern wall, facing the jheel, was about 25 feet high, with a thickness of 3 feet; immediately in rear and adjoining it was another wall 5 feet thick, and of a height sufficient to give a musketry fire over the outer wall. The curtain wall connecting this with the square redoubt, was 18 feet high and 5 feet thick.

All the works were of immense strength being of stone and lime cement, and when I visited them, they were found to be in excellent preservation.

Part of the works, consisting of a curtain wall outside of the western ditch, as also the detached buildings within the redoubt and northern wall, had been subsequently built by the Mahrattas, these being less breached and injured.

Besides the principal gateway (opening out to the south) there were two others leading into the main body of the redoubt, one to the North, and one to the West. There was also an entrance way in the North West curtain wall.

The interior arrangements were very complete. The open colonnade, with a few interior apartments, would have afforded ample cover for a large body of men, with space for their supplies. Water was obtained from a pucka well within the works, with an additional supply from the eastern tank, by means of a flight of stone steps leading down to it.

Bilheree Fort boasted of an *Aamkhass,* or Audience Hall, which with some interior apartments, occupied a space of 78 feet by 51 feet. This was a fine hall of elegantly shaped stone pillars, supporting a roof also of stone slabs and lime cement.

Situated in nearly the centre of the redoubt was the Ranee's or Queen's apartment, a two-storied building 78 feet by 68 feet. This and the *Aamkhass* were of the most solid construction.

A place of worship was provided (contained within a rectangular enclosure) in front of the *Aamkhass.*

From the above it will be gleaned that a few resolute men, supplied with provisions, could have held these fortifications for a considerable period, and against large numbers.

The walls would have successfully resisted the action of field guns. They were very scientifically loopholed, and with great care.

The key to the position was evidently by the principal gateway. Without guns of some calibre the place was unassailable from the north and east, and (unless the attacking party first occupied the town of Bilheree, which is within range of musketry fire) it was unassailable from the West; bearing this in mind, whilst I have endeavoured to render the whole of the works untenable, and uninhabitable, the work of destruction is more complete on the southern and south western face than elsewhere, the walls of which have been nearly levelled, and the deep ditch, as far as the first causeway, filled up, towards Jubbulpore.

(Signed,) D. C. Vanrenen,
Capt. Artillery and Revenue Survey.

The 30*th October*, 1857.

Statistics in reference to the old Fort of Bilheree, translated from papers in the possession of Mundlah Ram, *Ex-Kanoongoe of Bilheree.*

The Fort of Bilheree was built in the year A. D. 1489 by Luchmun Singh Pudhar Chutree, who held a Jagheer from the Nagode Rajah, consisting of 300 villages, which now constitute Pergunnah Bilheree.

Luchmun Singh, his son and grandson continued in possession of the Jagheer for 70 years, or until 1559, when it was taken by stratagem by a Gond Rajah named Mugroo Dooj; who had married the granddaughter of Luchmun Singh. The Gonds held

this Jagheer under the Mundlah Chieftain for 115 years; when on failing to pay the taxes levied on them by the Mundlah Rajah, the whole Jagheer was taken from them by the Mundlah Rajah, and by him made over to Juswunt Rao Mahratta, in the year A. D. 1674.

Juswunt Rao, assisted by 300 Sowars, held the government under the Mundlah Rajah, and on his death was succeeded by his son Moonga Rao, who reigned 78 years.

The Mundlah Rajah at that time, A. D. 1742, was at war with the Nagpore Rajah, and, suspecting Moonga Rao of treachery, caused him to be put to death and the Jagheer to be transferred to his favorites Nawab Ajeet Khan and Ahmud Khan, who had it on the same terms as Juswunt Rao. On their deaths in A. D. 1767 the Jagheer lapsed to the Mundlah Rajah, who managed it on his own account, and derived a yearly revenue of 20,000 Rupees.

The Mundlah Rajah was in his turn ousted by the Sagur Rajah, Bulwant Rao Pundit, in the year A. D. 1779 who again was deprived of the Sovereignty by Raghojee of Nagpore, from whom we took the country in the year A. D. 1816.

(Signed) D. C. Vanrenen, *Capt. Artillery,*

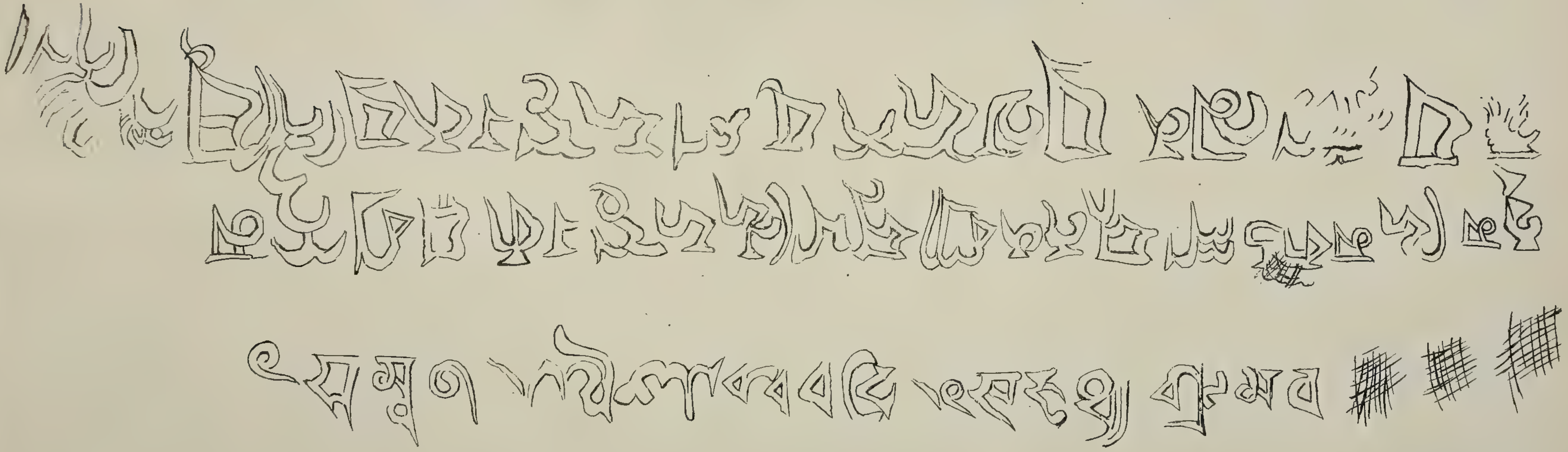
Jubbulpore, Revenue Surveyor's Office, the 3*rd October*, 1857.

5th.—Bábu Rájendralál Mitra read the following note on a stone bull found at Buddha Gaya and bearing a Sanscrit inscription, dated 781 of the Samvat era.

Note on a Stone Figure of a Bull from Buddha Gayá.

I am indebted to Mr. Grote for an opportunity of examining an interesting figure of a bull couchant with a Sanskrita inscription on its back, bearing date 781 of the Samvat, corresponding with 725 of the Christian era. It is an alto-relievo, and measures about 12 inches in height, the length being from the croup to the root of the neck 16 inches; the head is mutilated. Around the back is a string of bells, and the neck is bedecked with a variety of beaded ornaments. The figure is said to have been brought from Buddha Gaya, but had this information been wanting, the material (basalt) and the style of sculpture would have left little doubt as to the place of

FACSIMILE OF AN INSCRIPTION ON THE FIGURE OF A BULL FOUND AT BUDDHA GAYA.



LACK, LITHR. 4 WATERLOO ST: CAL: 1858.

of bells, and the neck is bedecked with a variety of beaded orna
ments. The figure is said to have been brought from Buddha Gaya
but had this information been wanting, the material (basalt) an
the style of sculpture would have left little doubt as to the place

its origin. The inscription is in the well-known Kutila characters, and records that the bull was consecrated by Srí Suphandi Bhattáraka son of Bhimakaullá, for the purpose of securing progeny. The language is simple, but owing to mutilations, two or three words are not legible. The second figure of the date is indistinct, and the word Samvat has the final consonant wanting, which is owing perhaps to an accidental omission on the part of the engraver, or more probably to a fondness for abbreviation, as I have noticed a similar omission in two or three other inscriptions. In the present day the word is generally written without the last two consonants and their intermediate vowel.

The subject of the inscription offers little for comment. The practice of dedicating bulls either alive or in effigy to secure progeny is a matter of no interest to the antiquarian, while the individual who consecrated the bull is not an historical personage; but the circumstance of the Kutila character being used in an inscription of the 8th century, affords an important subject for the consideration of the Indian Archæologist.

The absence of dates in many of the inscriptions found in India led the late Mr. James Prinsep to devise a system of palæographic chronology in which the style of the writing was taken as an index to the age of the document in which it was found. The system was matured after a careful examination of a large number of ancient inscriptions and coins, and recorded in a table (ante vol. VII. p. 276, plate xiii.) in which different centuries have each a particular set of characters assigned to it. According to this table the Kutila characters are placed against the 9th century. It is evident, however, that Mr. Prinsep intended his table to be merely tentative, and open to considerable corrections and modifications; for it is difficult to believe that he would take each particular set of characters to belong to one particular century and no more, or that the same character should be common over all the Sanskritic Cis-Vindhyan regions for a given period. Nothing is more common than a single style of writing spreading over two or three centuries, or predominating in certain regions, while it is dying out in others. The history of the English and the German characters affords a singular instance in point. Mr. Prinsep was fully aware of this, and has accordingly assigned

a range of three centuries to his No. I, or Lat characters, and of four centuries to No. IV. of the Guzerat plates.

Later chronologists have, however, missed the spirit of his table, and have used it in such a manner as to lead to serious mistakes. A distinguished antiquarian has lately taken so narrow a view of the table in question, as to argue an inscription* to be of the 10th century simply because it happened to be in a character very near the Kutila, without making any allowance for the range which that character must have had, the locality where the document was found, or the date which it bore. This, in our humble opinion, is a very unphilosophical mode of drawing conclusions. The inscription now submitted, compared with such inscriptions of this type as have been already published, will shew that the Kutila characters were current over a large tract, for upwards of four centuries.

The era of the document is Samvat, but whether of the sovereign of Oujjein or of Balhabi or of the Pál Rájás of Bengal, does not appear. It may, however, be very reasonably taken to be that of Vicramáditya, considering that the Balhabi Samvat did not extend much beyond Rájputáná, and the Pála Samvat would bring down the inscription to a period when the Kutila had been entirely superseded by the modern Deva Nagari.

The following is a transcript of the inscription.

ए सम्ब ७८१ वैशाखवदि ९ षरुध्य ग्रामव × × × त्तम भिमक उल्ला सुतेन श्रीसुफ- न्दि भट्टारक त्र (?) ग्र (?) त्तमतया × × त्मनपत्यदेतो इषभट्टारक प्रतिष्ठि- तेति ॥

R. M.

* I have now in hand a paper on the era of Bhoja, in which the claims of this inscription will be discussed in detail.

ERRATA.

Page 76 line 23 for वैँशास्व वदि *read* वैशाख वदि

„ „ „ 24 for दैँता *read* हेता

For December, 1857.

The Monthly General Meeting for December, was held on the 2nd instant.

Major H. L. Thuillier, senior member present, in the Chair.

The proceedings of the November meeting were read and confirmed.

Presentations were received—

1st.—From the Royal Academy of Sciences at Berlin, the latest publications of the Academy.

2nd.—From the Bombay Government a copy of the Magnetical and Meteorological Observations.

3rd.—From Rája Shib Chunder Devá, Báhádur, a copy of his treatise on Infant Treatment in Bengali.

The election of Mons. R. Schlagintweit as a corresponding member of the Society was once more postponed under rule 6 of the Society's bye-laws.

Babu Kaliprasanná Sing, was proposed for ballot at the next meeting by Babu Rajendralal Mittra, and seconded by Mr. Grote.

Communications were received—

1st.—From Babu Radha Nauth Sikdar, an abstract of the Meteorological Observations made in the office of the Surveyor General during July last.

2nd.—From Dr. G. von Liebig a paper entitled "Discussions of some Meteorological Observations made on Parasnath Hill."

3rd.—From Mr. Grote a letter, of which the following is an extract, referring to the Tertiary fossils in the neighbourhood of Kohat, presented to the Government Geological Museum by Dr. Garnett.

"An interesting letter was read by Professor Oldham at our June meeting of 1856, in which Lieut. Garnett of the Engineers described the country near Kohat, where Lieut. Trotter's fossils had been found. Lieut. Garnett asked for information about the specimens which had been sent down to the Society, and apparently also

to Professor Oldham. I have now a letter from Dr. Falconer, in which he tells me for communication to the Society that among the fossils sent to Mr. Oldham he has identified—

1st.—A species of *Dinotherium*, probably new.

2nd.—A species of a genus closely allied to *Tapir*, new to the Indian Fossil Fauna.

3rd.—*Amphicyon*, a species of a large carnivorous form, as heavy as the Polar bear. The genus occurs in the European Miocenes along with Dinotherium.

The specimens which Dr. Falconer has seen, are, he says, very imperfect. It might be worth while to consider at the next meeting, whether it would not be well for us to send home our specimens, should they be better than Mr. Oldham's, and get them described and returned to us.".

Resolved, that Mr. Grote's suggestions be referred to the Council, with power to do what they thought best in the matter.

Bábu Rájendralál Mitra read a paper on the traces of Buddhism in Norway in which he represented that the Odinic relics in N. W. Europe bear a strong similitude to the material remains of Buddhism in India, and that that similitude is attributable to a community of idea and design. The subject was illustrated by several drawings prepared by the boys of the Government Wards' Institution.

On the motion of the Chairman, the thanks of the meeting were accorded to the Bábu for his able and interesting paper.

The Librarian and the Zoological Curator submitted their usual monthly reports.

Library.

The Library received the following accessions during November last.

Presentation.

Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin, 1855, *Berlin*, Royal 4to.—By the Prussian Academy of Sciences.

———— Ditto ditto, Erster Supplement—Band, 1854, folio.—By the Same.

Monatsbericht der ditto ditto, from July, 1855 to October, 1856, 8vo. —By the Same.

The Transactions of the Linnean Society of London, Vol. XXII. Part I.—By the Linnean Society.

Journal of the proceedings of the ditto, Vol. I. No. 3.—By the Same.

Address of Thomas Bell, Esq. President, read at the Anniversary of the Linnean Society on Saturday, May 24th, 1856, *pamphlet.*—By the Same.

List of the Linnean Society of London, 1856, *pamphlet.*—By the Same.

Report (33rd Annual) of the Royal Asiatic Society of Great Britain and Ireland.—By the Society.

The Quarterly Journal of the Geological Society, Vol. XIII. Part I. No. 49.—By the Society.

Transactions of the Geological Society of London, Second Series, Vol. VII. Part 4th, 1856.—By the Society.

The Journal of the Royal Geographical Society, Vol. XXVII. 1856, 8vo.—By the Society.

The Journal of the Statistical Society of London, Vol. XX. Part III. —By the Society.

List of Fellows of the Statistical Society of London up to 30th June 1857.—By the Society.

Zeitschrift der Deutschen Morgenländischen Gesselschaft, Vol. XI. Heft. 1 to 3.—By the German Oriental Society.

The Geological Papers on Western India, 8vo. with an Atlas.—By the Bengal Government.

The Oriental Christian Spectator for October, 1857.—By the Editor.

The Calcutta Christian Observer for November, 1857.—By the Editor.

The Oriental Baptist for ditto.—By the Editor.

Magnetical and Meteorological Observations made at the Hon'ble East India Company's Observatory, Royal 4to. Bombay, 1856.—By the Bombay Government.

The Vividhártha Sañgraha, No. 42.—By Ba'bu Ra'jendrala'l Mitra.

La Poésie Philosophique et Religieuse chez les Persans d'apres le Mantic Uttaïr ou le Langage des Oiseaux de Farid-Uddin Attar, par M. Garcin de Tassy, *Paris,* pamphlet.—By M. Garcin de Tassy.

Note sur les Rubâ'iyât de 'Omar Khaïyâm, par M. Garcin de Tassy, *pamphlet.*—By the Same.

Exchanged.

Athenæum for August, 1857.

The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science for September, 1857, No. 92.

Annalen der Chemie und Pharmacie for July, 1857.

Purchased.

Grimm's (Dr. Jacob) Deutsche Grammatik, Vols. I. to IV. 8vo. *Gottingen*, 1822.

——————— Geschichte der Deutschen Sprache, Band I, Zweite auflage, 8vo. *Liepzig*, 1853.

——————— und Wilhelm Grimm, Deutsches Wörterbuch, Band I. and parts 1 to 4 of Band II. 4to. *Liepzig*, 1854.

——————— Deutsche Mythologie, Band I, Dritte Ausgabe, 8vo. *Gottingen*, 1854.

Mémoirs sur les contrées occidentales, traduits du Sanscrit en Chinois, en l'an 648, Par Hiouen-Thsang, et du Chinois en Francais par M. St. Julien, Tome I. Royal 8vo. *Paris*, 1857.

Ramayana (रामायणं) Poema Sanscrito di Valmici traduzione Italiana con note per Gaspare Gorresio, *Paris*, Vol. IX. Royal 8vo. 1856.

Mémoires de l'Académie Impériale des Sciences de Saint-Petersbourg, Six Series, Tome VII. 1st and 2nd Livraison.

Rig-Veda oder die heiligen Lieder der Brahmanen. Herausgegeben von Max Müller, Zwiete Lieferung 4to. *Liepzig* 1857, *pamphlet.*

Analectes sur l'Histoire et la Littêrature des Arabes D'Espagne, par Al-makkari. Publiés par M. R. Dozy, G. Dugat, L. Krehl et W. Wright, Tome I. Seconde Partie, 4to. *Leyde*, 1856.

Catalogue of Lepidoptera in the collection of the British Museum, Part I. *Papilionidæ. London*, Royal 4to. 1852.

Catalogue of Shield Reptiles in ditto, Part I. *Testudinata* (Tortoises), by J. E. Gray, 1855.

Bowring's (Sir John,) Kingdom and People of Siam; with a Narrative of the Mission to that country in 1855, 2 Vols. 8vo. *London*, 1857.

List of the Specimens in the Collection of the British Museum, 12mo. *London*, 1852.

Literary Gazette, Nos. 2117 to 2121.

Journal des Savants for August, 1857.

The Annals and Magazine of Natural History, No. 117.

Revue et Magasin de Zoologie, No. 7, 1857.

Revue des Deux Mondes, 15th August and 1st Sept. 1857.

Comptes Rendus, Nos. 5 to 8, August, 1857.

Gourdas Bysack,
Librarian and Asst. Secy.

1*st December*, 1857.

Report for December Meeting, 1857.

The only donations which I have at present to report upon are as follows—

1. Bábu Rájendra Mállika. The carcass of a fine *Bára Sing'ha* buck (Cervus Duvaucelei), the skin of which has been since mounted; and ditto of the common large Squirrel (Sciurus Elphinstonei), prepared as a skeleton.

2. C. B. Chalmers, Esq. 44th B. N. I. A fine skin of the Menura superba, or 'Lyre-bird' of N. S. Wales; since mounted.

3. J. Sweeny, Esq. An example of Python molurus, 13½ ft. long; obtained in the neighbourhood, but not improbably escaped from confinement.

4. From myself, the carcasses of two *Chitas* (Felis jubata), both skins and one skeleton set up;* of a *Sia-gosh* (F. caracal); Bear (Ursus labiatus); and large Monitor dracæna, the skeleton of which has been set up. Also a number of fishes, procured at the Sandheads: and, by purchase, an enormous skull of Ursus isabellinus, and one of U. tibetanus.

In a native shop where the latter were obtained, I found a large bag of Feline tusks or canine-teeth, comprising (at the lowest computation) those of about 250 Tigers and 150 Leopards. I have selected a fine series illustrative of the growth of the teeth, and of the magnitude attained by them.

I have also purchased, alive, but it has since died and been transferred to the museum, a very rare Parrakeet, the Palæornis erythrogenys, nobis (nec Lesson, nec Fraser), v. *P. nicobaricus*, Gould, and *P. barbatus* apud Pucheran (*Rev. Zool,* &c. 1856, p. 209). *P. erythrogenys* of Lesson was pre-applied, but is merely a synonym of the common P. longicauda (v. *malaccensis,* and the young—*P. viridimystax,* nobis, *J. A. S.* XXV, 446); for which reason Mr. Gould's name *nicobaricus,* bestowed under the impression that *erythrogenys* of Lesson was a particular species, cannot be accepted. *P. erythrogenys* of Fraser, again, is not only subsequent to erythrogenys, nobis, but bears the prior synonym of *Luciani,* J. Verreaux; and this bird appears to me to be the original barbatus of Gmelin,—*habitat* unknown, but probably from Cambodia or Cochin-

* The following mounted skeletons of Felis were exhibited at the Meeting. F. leo (N. Africa); F. tigris (enormous); F. pardus; F. jubata; F. caracal; F. celidogaster (v. *viverrina*); F. bengalensis; F. chaus; and Indian F. domestica.

China (and to the same little explored region most probably appertains the P. DERBIANUS, Fraser). The specimen of P. ERYTHROGENYS now exhibited was imported from Singapore, but was doubtless originally obtained from the Nicobar Islands by Malayan traders, no other *habitat* being at present known for this fine species. The specimen was a female, and is the only example of that sex which I have yet seen; those formerly supposed to be females being evidently young males. The female differs from the male in having a conspicuously smaller bill, of a blackish colour, whereas the upper mandible of the male is coral-red; though perhaps old females may have the upper mandible red as in the male, as commonly in P. JAVANICUS, (Osbeck, v. *Osbeckii*, Latham, v. *mystaceus*, Shaw, &c.,—*ponticerianus*, Gmelin, being a misnomer),—and always, I think, in P. LONGICAUDA; the head, nape, and upper-parts, are also much more uniformly green; and the red of the cheeks is less intense. This handsome species is figured in the 9th part of Mr. Gould's splendid 'Birds of Asia,' together with P. CANICEPS, nobis, and P. BARBATUS, (Gmelin, v. *Luciani*, J. Verreaux). We have now both male and female of P. ERYTHROGENYS, mounted from fresh specimens in good plumage that had died in captivity.*

December 2nd, 1857. E. BLYTH.

* I subjoin a synopsis of the species of this genus with their synonyms, according to latest information.

1. P. ALEXANDRI; *Psittacus Alexandri*, L.: *Ps. eupatria*, L., et *Psittaca gingininiana*, Brisson,—the female; *Psittacus guinneensis*, Scopoli (nec *guineensis*, Gmelin); *Ps. Sonneratii*, Gmelin; *Pal. nipalensis*, Hodgson. Figured in Edwards's Birds, pl. 292. Inhabits the hilly regions of all India proper, from the sub-Himaláyas to Ceylon inclusive; with those of Asám, Sylhet, Arakan, and the Tenasserim provinces,—except southward, as in Tavoy and Mergui. The ordinary Parrakeet of the Punjáb generally. The very young are brought in considerable numbers to Calcutta, the earliest towards the close of February; and many old birds also, chiefly from the Midnapur jungles, as I am assured: and according to Buchanan Hamilton *(MSS.)*, flocks visit the neighbourhood of Calcutta when the crop of rice is ripe. These doubtless come from the hilly country westward of the delta; and, I suspect, return to their distant roosting-places in the hills towards sunset (for the birds of this genus are apt to roam thus over a vast extent of territory). Though figured by Sonnerat from the Philippines, it is probably only known there in a captive state.

2. P. TORQUATUS; *Psittaca torquata*, Brisson (*Psittacus torquatus*, Gmelin, in part): *Psittacus steptrophorus*, Desmarest; *Ps. cubicularis* (?), Hasselquist; *Ps. docilis* (?), Vieillot; *Pal. Layardi*, Blyth (var.): *lutino* variety.—'Sulphur Parrakeet,' Shaw. Inhabits the plains of all India, in great abundance; also Ceylon, but is rarer eastward of the Bay of Bengal, though found (sparingly?) as

far southward as Province Wellesley. In Africa found from Abyssinia to Senegal, where stated by the late H. E. Strickland to be "identical with specimens from India." Col. Chesney also notices this species in Syria, as abounding in the spring *(Journal of Euphrates Expedition*, I, 443, 537). But Swainson states that Senegal specimens are smaller, with closed wing " not quite 6 in." In India the ordinary length of wing is 6½ in., and in fine old males 7 in. The late Prince of Canino would separate " the race of Senegal" by the name P. DOCILIS, (Vieillot). *Comptes Rendus*, March 1857.

3. P. BITORQUATUS ; *Psittacus bitorquatus*, Kuhl : *Ps. bicollaris*, Vieillot ; *Pal. borbonicus*, C. L. Bonap. Inhabits Mauritius and Bourbon.

4. P. COLUMBOIDES, Vigors : *P. melanorhynchos*, Sykes (nec Wagler), the female or young. Figured in *Madr. Journ.* XI, 209, and in Jerdon's 'Illustrations of Indian Ornithology,' pl. XVIII. Inhabits the Nilgiris and Malabar ghâts.

5. P. CALTHRAPÆ, Layard : *P. Gironieri*, Verreaux ; *P. viridicollis*, Cassin. Peculiar to the mountain region of Ceylon ; being the only species met with at Newera Elia.

6. P. SCHISTICEPS, Hodgson : *Conurus himalayanus*, Lesson. Common in the middle and lower region of the Himaláya, extending eastward to the Kás'hya hills, where also common ; but never seen in the plains. Westward, the late Dr. Griffith observed it in flocks at Pushut. Captive specimens are not unfrequently brought to Dacca, but seldom to Calcutta.

7. P. CYANOCEPHALUS ; *Psittacus cyanocephalus*, L. (the female) : *Psittaca bengalensis*, Brisson ; *Psittacus signatus*, Scopoli ; *Ps. erythrocephalus*, Gmelin ; *Ps. ginginianus*, Latham ; *Ps. rhodocephalus*, Shaw : *lutino* var.—*Ps. narcissus*, Latham (with coloured figure) : *Ps. flavitorquis*, Shaw, *Ps. annulatus*, Kuhl, and *Pal. flavicollaris*, Franklin,—the female. Figured in Edwards's Birds, pl. 233. Inhabits the upland jungle districts of all India proper, with Ceylon, Asám, Arakan, and the Tenasserim provinces ; replacing in the lower hills, for the most part, the P. TORQUATUS of the plains. When the rice is ripening, flocks visit the neighbourhood of Calcutta ; but probably return to their hill roosting-places by sunset, however great the distance. Though figured by Sonnerat from the Philippines, it is probable that captive specimens only are there known ; and the same with China. Immense numbers are taken from Calcutta in the shipping.

The rest of the genus have a broad black moustachial mark, and constitute the *Belocercus* of the Prince of Canino.

8. P. CANICEPS, nobis. Figured in Gould's 'Birds of Asia.' A male obtained in the Nicobars, and a female in Province Wellesley ; the only examples as yet known.

9. P. JAVANICUS ; *Psittacus javanicus*, Osbeck : *Ps. bimaculatus*, Sparrman ; *Ps. pondicerianus* et *Ps. borneus*, Gmelin ; *Ps. Osbeckii*, Latham ; *Ps. mystaceus*, Shaw ; *Pal. melanorhynchos*, Wagler (nec Sykes), et *P. nigrirostris*, Hodgson,—the female ; *P. modestus*, Fraser,—the young. Figured in Swainson's *Zool. Ill.* 2nd series, pl. 16. The most common species of the Indo-Chinese countries generally ; but not seen wild on the western side of the Bay of Bengal (though *pondicerianus* is one of its synonyms) ; neither, according to Dr. S. Müller, does

it inhabit Borneo (though *borneus* is another synonym); though common in Java. It also abounds in Sylhet, Asám, and Nepâl; and inhabits the Rajmahl hills, resorting in great flocks to the neighbouring plains when the crops are ripening. Buchanan Hamilton observed them "in the woods near Gorruckpore." Vast numbers are obtained by the Calcutta bird-dealers, even when very young; which are brought from Tipperah and Chittagong, as I am assured. Javanese specimens are undistinguishable from Indian.

10. P. DERBIANUS, Fraser. *Hab.* —— ?

11. P. BARBATUS; *Psittacus barbatus*, Gmelin: *Pal. Luciani*, J. Verreaux; *P. erythrogenys*, Fraser; *P. Fraseri*, Moore. Figured in Gould's 'Birds of Asia.' *Hab.* —— ?

12. P. ERYTHROGENYS, nobis: *P. nicobaricus*, Gould; *P. barbatus* apud Pucheran. Figured in Gould's 'Birds of Asia.' Peculiar to the Nicobar islands where an abundant species.

13. P. LONGICAUDA; *Psittacus longicauda*, Boddaert: *Ps. malaccensis*, Gmelin (nec Brisson, nec Latham); *Ps. erubescens*, Shaw; *Ps. ginginianus*, var, C. Latham; *Ps. barbatulatus*, Bechstien; *Pal. erythrogenys*, Lesson (nec Blyth, nec Fraser); *P. viridimystax*, Beilyth,—the young. Figured by Levaillant, pl. 72. Inhabits Sumatra, Borneo, and the southern portion of the Malayan peninsula,—being the only PALÆORNIS there met with, and having the same range of distribution as PSITTINUS MALACCENSIS and LORICULUS GALGULUS; these three being the only known Parrots that inhabit that range of territory! and in Java there are only PAL. JAVANICUS and LORICULUS VERNALIS, both of which are also common in the Burmese countries.

I add the synonyms of

14. PSITTINUS MALACCENSIS; *Psittacus malaccensis*, Latham (nec Brisson, nec Gmelin): *Ps. incertus*, Shaw; *Agapornis azureus*, (Temminck), Bonap., *passim; Psittacula reticulata*, Lesson. Figured in Swainson's *Zool. Ill.*, 1st series, pl. 154. Barely separable from PALÆORNIS, but has a short even tail. Has the same range of distribution as PAL. LONGICAUDA and LORICULUS GALGULUS.

For January, 1858.

At the Annual General Meeting of the Society, held on the 6th January 1858.

Hon'ble Sir James Colvile, Kt., President, in the Chair.

The Secretary read the following

Report for 1857.

The Council regret that, in submitting their annual report for 1857, they cannot congratulate the Society upon the state of its affairs. The troubles into which the country has been plunged have to serious extent interfered with the Society's progress and prosperity.

The rolls exhibit a sudden decrease of 22 ordinary members resident in India, the total at present being 109, whereas it was 131 at the same period of last year. The elections during the year have been only 6, while the loss amounts to not less than 26, of which 14 have been caused by retirement, and 12 by death. The Society now includes 147 members, of whom 38 are absent in Europe.

	Ordinary.	Paying.	Absent.
1851	130	124	6
1852	139	122	17
1853	146	123	23
1854	155	129	26
1855	162	128	34
1856	167	131	36
1857	147	109	38

Mr. John Nietner, of Colombo, Ceylon, has been elected a corresponding member during the period under review.

Obituary.—The members lost to the Society by death, are Dr. Spilsbury, Vice-President, and Dr. Walker, Sir Henry Lawrence, K. C. B., Sir Robert Barlow, Bart., Hon'ble J. R. Colvin, Captain F. Hayes, Hon'ble Major R. B. P. Byng, and Messrs. Bushby, Heatly, Ommanney, Cunliffe and D. Grant, most of whom had, when resident in Calcutta, taken as members either of the Council, or the Committee of papers an active part in the management of the Society's affairs.

To the zealous and disinterested labours of Dr. Spilsbury, extending over a period of 20 years, the Society is indebted for some of the rarest specimens which adorn its Geological Museum, and many of the valuable contributions which enrich the pages of its Journal. The Society has, more than once, publicly recorded its

high sense of the important services rendered to it by this zealous and distinguished member, and recently testified its gratitude by subscribing for the portrait which now graces its Meeting room.

Dr. Walker, whose zealous and disinterested devotion to science is well known, was a sincere and cordial friend to, and promoter of the objects of the Society.

Captain Hayes was a well known Persian and Arabic Scholar, and for some time acted as Secretary to the Society. His services in that capacity were acknowledged by a vote of thanks passed in May 1851.

Such losses as the above, and as that of Sir Henry Lawrence and Hon'ble Mr. John Colvin, who also took an earnest interest in the Society's welfare, are not to be immediately or easily repaired.

By the death of the Baron Von Hammer Purgstall the cause of Oriental Literature has lost one of its brightest ornaments, and most ardent advocates, and the Society its oldest and not least distinguished honorary member. He devoted a long life of 82 years to the study of the Arabic, Persian and Turkish languages, and the success with which he prosecuted his researches is attested by the numerous works which he has left behind him. The Society is especially indebted to him for a valuable paper on the navigation of the Arabs, published in the Journal.

Finances.—The steady improvement which the finances of the Society were gradually making, has received a severe check by the recent disturbances. The collections during the last year have been less than what was anticipated, while the statement of outstanding assets continues to be nearly the same as at the close of 1856.

The total receipts during the last year as shewn in the statement No. 1, have been Rs. 19,828-12-3, exclusive of the subscriptions (Rs. 2,676) for the purchase of the Stacey Coin collection, which have been deposited on a separate account in the Bank of Bengal.

The receipts include an item of Rs. 765-5-4, being a part of the loan recovered from the Oriental Publication Fund.

The disbursements amount to Rs. 24,001-2-1, inclusive of a sum of Rs. 4,000, which have been invested in Government Securities. The cash balance in hand is Rs. 2,330-9-3, which added to the remaining loan Rs. 1,734-10-8, due from the Oriental Publication

Fund, will amount to Rs. 4,065-3-11, a sum adequate to meet any contingent expences that may be necessary for the purpose of a thorough repair to the building.

The total of the outstanding sums due to the Society is Rs. 8,463-2-6. The amount written off to profit and loss since the last report is Rs. 1,810-5-3, being mostly subscriptions due from deceased members. The Council apprehend that several items of a similar nature will have to be removed in the same way.

The estimate of the probable income and expenditure of the current year is given below. The expenses of the Zoological Museum have increased by Rs. 45 per month.

Income.

Contributions, ...Rs.				7,850	0	0
Government Grant at 300, ...				3,600	0	0
Sale of Books, ...				1,200	0	0
Journals, ...				1,000	0	0
Interest, ...				225	0	0
Miscellaneous, ...				25	0	0
				13,900	0	0
Monthly average, ...				1,151	5	4

Expenditure.

Zoological Museum, ...				4,740	0	0
New cases, 7, about, ...				900	0	0
Library.						
Establishment, ...	936	0	0			
Purchase of Books, ...	600	0	0			
Book-binding, ...	350	0	0			
Contingencies, ...	200	0	0			
				2,086	0	0
Establishment, General				1,865	0	0
Journal, ...				2,896	0	0
Miscellaneous, including building repairs, ...				3,500	0	0
Deposit, ...				149	0	0
				16,136	0	0
Monthly average, ...				1,344	8	0

Reduction of Subscription of Mofussil Members.—In December 1856, Mr. Oldham made a proposition, to the effect that Rule 8 of the Society's Code should be modified so far as related to the subscriptions of non-resident members. That Ordinary Members should be divided into two classes, "Resident and Non-Resident," and that the latter, *i. e.*, the members who reside permanently at a greater distance than 12 miles from Calcutta or who may only occasionally visit it for periods shorter than three months, should pay the same admission fee, but a reduced subscription of 32 Rs. per annum.

The Council to whom the question was referred under Rule 45, reported, after mature consideration, that the financial position of the Society was not such as to permit them to recommend the proposed change, and, on its being referred to the Society at large, very few of the Non-resident Members voted in its favor. The motion was finally dropped at the Special Meeting held in July last, in consequence of a sufficient number of members not being present to constitute a Special Meeting as provided in Rule 45.

Library.—The Library has received an addition of 150 volumes, among which are some important MS. works, purchased at the sale of the late Aga Kurbalai Mahomed's Library. Several Sanscrit MSS. have been re-copied, and supplies of the leading Scientific periodicals have been regularly received. All the valuable books are now preserved in glazed cases, and every care is taken to keep them in proper order.

The Librarian has prepared a Supplement to the printed Catalogue, which includes all the works received from the time the Catalogue was sent to the press to the last day of December. This supplement will be available to members as soon as it is printed.

Coin Cabinet, Stacy's Collection.—In November 1856, the magnificent collection of gems and coins belonging to the late Colonel Stacy was offered to the Society for sale at 5,000 Rs. a sum which was subsequently reduced to 4,000 Rs. The Council anxious to secure to the Society this valuable collection, opened a subscription among the members, with a view to raise such a sum as would defray the whole or a large part of the amount necessary for the purpose. In a short time the sum of Rs. 2938 was subscribed, of

which Rs. 2,726 have already been realized. The Society has sanctioned an expenditure of Rs. 1,200, towards the purchase, which has been delayed only in consequence of the disturbed state of the country.

Some improvement has been effected in the arrangement of the Society's Coin Cabinet by Mr. Freeling; and it is hoped that on the receipt of the Stacy collection, the whole Cabinet will be systematically arranged, and rendered easily accessible to the public.

Museum of Economic Geology.—On the removal of the Government Museum of Economic Geology from the custody of the Society in 1856, the Government of India invited the Society to permit their own collections to be also transferred to the charge of the Superintendent of the Geological Survey in India, under such restrictions as the Society might chose to impose. The Council was divided in opinion on this question, and the proposition having been referred to the Society at large, was negatived at the last annual meeting.

Museum.—The Museum continues to be an object of interest and attraction to the public. That it is generally appreciated is shown by the figures quoted in the margin. During the year under review there were 43,928 Visitors, which, exclusive of Sundays and other Christian holidays, give an average of 142 persons per diem.

From Jan. to Dec. 1857 being 309 days open, exclusive of Sundays and other Christian holidays.

Native Males.	Females.	European Males.	Females.
38,430	2,090	2,597	811
		Total	43,928

Several glazed cases have been provided for the preservation and display of Zoological specimens, and the hands of the Curator in that Department have been strengthened by an increase of his establishment.

Dr. Falconer's important Catalogue of Tertiary fossils in the Society's collections, is in the Press, and will shortly appear.

Proposed Imperial Museum.—A careful inquiry into the condition of the Museum, its growing importance, and the scanty accommodation available in the Society's building, together with the inadequacy of the funds at their disposal, impressed the Council with the necessity of appealing to Government for aid. After mature deliberations they resolved that the most satisfactory mode of dealing with this important question would be to petition the Government

to institute a great Imperial Museum in Calcutta, to which the whole of the Society's collections might be transferred under certain restrictions. The Society approved the suggestion, and authorized the Council to open negotiations with the Government on the subject. But before any communication could be made the disturbances broke out in the North-Western Provinces, and the subject has since remained in abeyance.

A Committee of Meteorology and Physical Science has been reconstituted, consisting of the following Members:—

The Venerable J. H. Pratt.
Major H. L. Thuillier.
Dr. G. von Liebig.
Lt.-Colonel R. Strachey.
H. Piddington, Esq.
Baboo Radha Nauth Sikdar.

Journal.—The necessity of the times and the absorbing interest excited by the revolt, have operated prejudicially on the publication of the Journal. Comparatively few papers having been received, only 4 Nos. have been issued; the fifth is now in the press.

Officers.—The Librarian and Assistant Secretary, Baboo Gourdas Bysack has been assiduous in carrying on the duties of his office, and the Council have great pleasure in recording their entire satisfaction with the way in which he has performed them.

Oriental Fund.—The reasons which led to the suspension of the publication of the Bibliotheca Indica, were explained in the last annual report. The Council are glad to state that a considerable reduction in the liabilities of the Oriental Fund has been effected during the year, and they hope that before long the Fund will be in a position to enable the Editors to complete the unfinished works, and to commence a new Series under better auspices.

With the exception of the supplement to the Itqan, and the concluding Fasciculus of the S′ankhya Pravachana Bháshya (No. 141), no portion of the Bibliotheca Indica has appeared during the past year.

The report was adopted.

The Meeting then proceeded to ballot for the Council and officers for the ensuing year.

Major Thuillier and Dr. Eatwell were appointed scrutineers, and at the close of the ballot, the Chairman announced the following result:

Hon'ble Sir J. W. Colvile, Kt., *President.*

Bábu Rámgopal Ghose,
A. Grote, Esq.
Lieut.-Col. R. Strachey, } *Vice Presidents.*

T. Oldham, Esq.,
C. Beadon, Esq.,
Dr. T. Thomson,
Dr. T. Boycott,
Captain C. B. Young,
E. A. Samuells, Esq.,
Captain Dickens,
Captain Lees,
Bábu Ramáprasád Roy,

W. S. Atkinson, Esq.,
E. B. Cowell, Esq., } *Joint Secretaries.*

STATEMENT

Abstract of the Cash Accounts

RECEIPTS.

	1856.		1857.
CONTRIBUTIONS.			
Received from Members, ..	8,096 0 0		7,068 0 0
ADMISSION FEE.			
Received from new Members, ..	448 0 0		256 0 0
JOURNAL.			
Sale proceeds of, and Subscription to the Journal of the Asiatic Society, ...	768 10 0	1,822 14 0	
Ditto received from the Bank of Bengal on old account, ..		108 12 5	
			1,931 10 5
LIBRARY.			
Sale proceeds of Books, ..	1,662 1 9		1,225 4 0
MUSEUM OF ZOOLOGY.			
Received from the General Treasury, at 300 Rs. per month, ..	3,600 0 0		3,600 0 0
SECRETARY'S OFFICE, ..	5 3 3		
Discount on Postage Stamps, ...		1 11 6	
Refund of Postage, ...		7 10 0	
			9 5 6
VESTED FUND, ...	125 12 1		
Interest on Company's Paper from the Bank of Bengal,..		130 0 0	
Discount on ditto, ...		10 0 0	
Interest on 2,500 Rs. advanced to the O. P. Fund, from Jan. to 31st Dec. 1857, at 4 per cent., ...		100 0 0	
			240 0 0
GENERAL ESTABLISHMENT.			
Savings,..	2 2 0		74 9 9
DEPOSIT ACCOUNT, ..	216 11 0		
Hon'ble R. B. Byng, ...		64 0 0	
Lt. H. Raverty, ...		90 0 0	
F. E. Hall, Esq.		43 5 0	
Lt. Terrot, ...		11 0 0	
Rev. Isidor Lowenthall, ...		13 0 0	
			221 5 0
Carried over, ..			14,626 2

No. 1.

of the Asiatic Society for 1857.

DISBURSEMENTS.

	1856.		1857.
CONTRIBUTIONS.			
Refund of contributions to A. Christison, Esq. ..	..	.. ..	32 0 0
JOURNAL.	2,912 12 8		
Freight,..		75 1 0	
Printing Charges, ...		2,086 8 0	
Lithographing, ...		259 0 0	
Commission on Sale of Books, ..		13 1 3	
Purchase of Postage Stamps, ..		5 0 0	
Petty Charges, ...		11 7 6	
			2,450 1 9
LIBRARY, ...	2,216 15 11		
Salary of the Librarian, 12 months, at 70 per month, ..		840 0 0	
Establishment ditto, at 8 per month,		96 0 0	
Purchase of Books, per Messrs. Williams and Norgate, .. Rs.	4392 8 0	4,569 5 9	
Ditto ditto, Calcutta, ..	176 13 9		
Printing 200 Catalogues of Books and Maps in the Library, ..		680 12 0	
Book Binding, ...		470 12 0	
Stationery, ...		1 14 0	
Postage, ...		23 11 0	
Purchase of Silver Coins,		4 0 0	
Commission on sale of Books,		58 7 0	
Printing receipts and circulars,		20 0 0	
Cleaning Charges, ...		6 12 0	
Petty Charges, ...		32 14 9	
			6,804 8 6
MUSEUM OF ZOOLOGY, ..	4,133 13 0		
Salary of the Curator at 250 per month, 12 months, ..		3,000 0 0	
House rent at 40 per month, 12 months, ...		480 0 0	
Establishment, ...		815 15 3	
Contingent charges, ..		149 15 6	
Extra Taxidermist's Salary, ..		45 10 9	
Printing 250 Copies of bills for Government Allowance, ..		5 0 0	
			4,496 9 6
SECRETARY'S OFFICE, ..	1,720 15 10		
General Establishment, ..		782 0 0	
Secretary's Office Establishment,		670 0 0	
Copying Charges, ...		6 0 0	
Carried over,		1458 0 0	13,783 3 9

RECEIPTS.

Brought forward, ..		14,626 2 8
STACY COIN COLLECTION,		
Received subcriptions for the purchase of the Collection, ...		2,676 0 0
MESSRS. WILLIAMS AND NORGATE,		
Received from Rajah Radhacant Deva, ...	2 0 3	
,, sale proceeds of a copy of Bopp's Comparative Grammar, ...	25 0 0	
,, for sundry Books purchased, ...	4,392 8 0	
		4,419 8 3
BUILDING.		
Received from the Municipal Commissioner's office, remission of the Lighting charges for the 1st and 2nd quarters of 1857, ...		15 0 0
ORIENTAL PUBLICATION FUND.		
Received by transfer from Messrs. Williams and Norgate's account, Sale proceeds of Bib. Indica, ...		765 5 4
G. H. PLOWDEN, ESQ.		
Refund of Postage, ...		0 4 0
DADOBA PUNDURANG, ESQ.		
Received on account current of Freight, ...		2 8 0
BALANCE OF 1856.		
Bank of Bengal, ...	6,574 14 10	
Cash in hand, ...	89 15 3	
		6,664 14 1
Inefficient Balance, ...		470 0 3
Carried over,		29,639 10 7

DISBURSEMENTS.

Brought forward,	1458	0	0	13,783	3	9
Postage, ...	20	3	3			
Stationery, ...	77	5	6			
Purchase of Postage Stamps, ..	58	8	0			
Printing Charges, ...	69	9	3			
Engraving a plate for contribution bills, ...	10	0	0			
Petty Charges, ...	45	6	9			
				1,739	0	9
Vested Fund.						
Purchase of Government Securities, ...	0	0	0	4,000	0	0
Commission paid to the Bank of Bengal for investing in Company's Paper 4,000 Rs. @ 4 per Cent., ...	0	0	0	10	0	0
Paid Commission for the Collection of interest on Company's Paper, ...	0	5	3			
Do. Interest on Company's Paper,	2	3	6			
Ditto for renewing company's papers, ...	9	0	0			
				11	8	9
Deposit Account,						
F. E. Hall, Esq., ...	75	7	0			
Hon'ble Sir J. W. Colvile, Kt.,..	12	0	0			
W. Theobald, Esq.	10	8	0			
Hon'ble R. B. Byng, ..	48	0	0			
W. S. Blanford, Esq. ..	10	0	0			
				155	15	0
Stacy Coin Collection.						
Paid to the Secretary by a cheque to be kept on a separate acct.				2,726	0	0
Messrs. Williams and Norgate,						
Paid H. Piddington, Esq. as per their order, ...	780	0	0			
Purchase of Books on their Account, ...	77	0	0			
Freight on Do. Do. ..	11	4	0			
Amount paid for purchase of books from 1853 to 1857 by transfer of the sale proceeds of the Society's publications in their hands, ..	2,102	7	4			
				2,970	11	4
Building,						
Assessment, ...	280	0	0			
Ditto for Lighting Gas, ..	63	0	0			
Sundry Repairs, ...	56	11	6			
Paving the floor with Stones, ..	495	7	0			
				895	2	6
				26,291	10	1

RECEIPTS.

Brought forward,	29,639 10 7
	29,639 10 7

MEMO. OF DEPOSITS.

Balance at the close of 1856,	..	..	..	362	13	0
Amount credited in 1857,	..	..	..	221	5	0
				584	2	0
Deduct debited in ditto,	..	..	..	155	15	0
Balance at the close of 1857,	..	..	..	428	3	0

The Asiatic Society's Room,
The 31*st December,* 1857.

E. E.
GOURDAS BYSACK,
Asst. Secy.

DISBURSEMENTS.

		Brought forward,	26,291 10 1
G. H. Plowden, Esq.			
Postage stamps paid on his account, ...			0 4 0
Dadova Pandurang, Esq.			
Postage stamps paid on his account, ...			2 5 0
Miscellaneous, ..	233 0 0		
Advertising Meetings, ..		49 3 0	
Meeting Charges, ...		146 8 0	
Printing balloting papers, &c. ..		20 0 0	
New Mats for the Rooms, ..		88 3 0	
Repairing a Clock, ..		8 0 0	
Gardener's wages, ...		14 12 9	
Petty Charges, ...		106 4 3	
			432 15 0
Balance.			
Bank of Bengal, ...		2,321 11 3	
Cash in hand, ...		8 14 0	
			2,330 9 3
Inefficient Balance, ...			581 15 3
			29,639 10 7

W. S. Atkinson,

Secretary.

STATEMENT

Abstract of the Oriental

RECEIPTS.

	1856.		1857.
BALANCE OF 1856, Bank of Bengal,	283 13 6		
Cash in hand, ...	1 14 0		
		285 11 6	
Inefficient Balance, ...		2,092 14 8	
			2,378 10 2
SALE OF ORIENTAL PUBLICATIONS, ...	1,323 12 11		
Received by sale of Bib. Indica, ..		1,066 1 4	
Ditto by subscription to Do., ..		91 10 0	
			1,157 11 4
GOVERNMENT ALLOWANCE, ..	6,000 0 0		
Received from General Treasury at 500 per month, ...			6,000 0 0
VESTED FUND, ...	209 7 6		
Interest on Company's Paper from Government Agent, ..		140 0 0	
Ditto on Ditto from Bank of Bengal, ...		70 0 0	
			210 0 0
CUSTODY OF ORIENTAL WORKS Fine,			2 0 0
		Carried over,	9,748 5 6

No. 2.

Fund for the year 1857.

DISBURSEMENTS.

	1856.		1857.
SALE OF ORIENTAL PUBLICATIONS,	79 11 9		
Freight, ...		18 0 0	
Commission, ...		35 13 6	
			53 13 6
PURCHASE OF BOOKS & MSS.			
From Messrs. Mackenzie, Lyall and Co. and others, ..			334 6 0
VESTED FUND.			
Commission paid to the Bank of Bengal for collecting Interest on Company's Paper, ..		0 8 6	
Interest paid to the Asiatic Society on the Loan of Rs. 2,500,		100 0 0	
			100 8 6
CUSTODY OF ORIENTAL WORKS,	705 1 6		
Salary of Librarian at 30 per month, 12 ms., ...		360 0 0	
Establishment at 12 per month ditto,..		144 0 0	
Book binding, ...		129 0 0	
Books cleaning, ...		20 0 0	
Copying Charges, ...		4 0 0	
Extra Duftry, ...		12 8 0	
Petty Charges, ...		2 8 0	
Printing Charges, ...		5 0 0	
Commission on Purchase of Books,		5 0 0	
Stationery, ...		1 0 0	
			683 0 0
ASIATIC SOCIETY.			
Amount due to the O. P. Fund on account of the sale of Bib. Indica as per Accounts Current of Messrs. Williams & Norgate, £76-10-8, ...			765 5 4
COPYING OF MSS., ..	78 9 3		
Copying charges, ...			80 3 9
VASAVADATTA, ..	228 6 0		
Printing Charges, ...			224 0 0
UPANISHADS.			
Printing Charges, ...			448 0 0
MARKANDEYA PURANA, ..	465 0 0		
Printing Charges, ...		232 8 0	
Editing Charges, ...		60 0 0	
			292 8 0
		Carried over,	2,981 13 1

Brought forward,	9,748	5	6
	9,748	5	6

E. E.

The Asiatic Society's Rooms,
The 31*st Dec.* 1857.

GOURDAS BYSACK,
Asst. Secy.

		Brought forward,	2,981 13 1
TADZ KERAL.			
Printing Charges, ...			96 0 0
SANHITA OF THE BLACK YAJUR VEDA.			
Printing Charges, ...			904 0 0
WAQIDY, ...	675 8 0		
Printing Charges, ...			232 12 0
BRIHAD ARANYA UPANISHADS,	160 0 0		
Printing Charges, ...			332 0 0
BALANCE.			
Bank of Bengal, ...	3,059 9 0		
Cash in hand, ...	29 4 9		
		3,088 13 9	
Inefficient Balance, ...		2,112 14 8	
			5,201 12 5
			9,748 5 6

W. S. ATKINSON,

Secretary.

STATEMENT No. 3.

Assets.

CASH.	1856.			1857.		
Bank of Bengal, ...Rs.	6,574	14	10	2,311	11	3
Cash in hand, ...	89	15	3	8	14	0
Inefficient Balance, ...	470	0	3	581	15	3
Company's Paper, ...	500	0	0	4,500	0	0
Loan to the Oriental Publication Fund, ...	2,500	0	0	1,734	10	8
	10,134	14	4	9,137	3	2
OUTSTANDING.						
Contributions,..................	7,205	11	8	7,146	2	6
Admission Fee, ...	96	0	0	96	0	0
Library, Sale of Books,.........	329	4	0	289	0	0
Journal, Subscription to, ...	1,185	12	0	866	8	0
Ditto, Sale of, ...	9	8	0	65	8	0
	8,826	3	8	8,463	2	6

Liabilities.

DEPOSITS.	1856.			1857.		
Hon'ble Sir J. W. Colvile, Kt., ...	291	8	0	279	8	0
Other Deposits, ...	0	0	0	148	11	0
DEBTS.						
J. W. Laidlay, Esq..............	418	7	4	418	7	4
Journal Nos. IV. and V. of 1857, say,..........................	0	0	0	497	0	0
Miscellaneous Printing, about, ...	135	0	0	250	0	0
Messrs. Williams and Norgate, ...	0	0	0	990	0	11
New Glazed cases for the Bird Room, ...	0	0	0	659	8	0
				3,243	3	3

E. E.

GOURDAS BYSACK,
Asst. Secy.

W. S. ATKINSON,
Secretary, Asiatic Society.

The Asiatic Society's Rooms,
—The 31st December, 1857.

LIST OF ORDINARY MEMBERS

OF THE

ASIATIC SOCIETY OF BENGAL,

ON THE 31ST DECEMBER, 1857.

The * distinguishes non-subscribing Members.

Abbott, Lieut.-Col. J. Bengal Artillery, Ishapur.
*Allen, C. Esq. B. C. S., Europe.
*Anderson, Lieut.-Col. W. Bengal Artillery, England.
Atkinson, W. S. Esquire, Calcutta.
Avdall, J. Esquire, Calcutta.
*Baker, Lt.-Col. W. E. Bengal Engineers, Europe.
Batten, J. H. Esquire, B. C. S., North West Provinces.
Beadon, C. Esquire, B. C. S., Calcutta.
Beaufort, F. L. Esquire, B. C. S., Calcutta.
Beckwith, J. Esquire, Calcutta.
*Benson, Lt.-Col. R., England.
Birch, Col. R. J. H. C. B., Calcutta.
Bivar, Capt. H. S. 18th Regt. B. N. I., Northern Cachar.
Blagrave, Capt. T. C. 26th Regt. B. N. I. Trans-Sutledge Provinces.
Blanford, H. F. Esq. Government Geological Survey.
Blundell, E. A. Esquire, Singapore.
*Bogle, Lt.-Col. Sir A. Kt., England.
Boycott, Dr. T. Bombay M. S., Calcutta.
*Brodie, Capt. T. 5th Regt. B. N. I., Europe.
Burgess, Lt. F. J. 17th Regt. B. N. I., Nowgong.
Busheerooddeen Sultan Mahamed, Saheb, Calcutta.
Campbell, Dr. A. B. M. S., Darjiling.

Chapman, C. Esq. B. C. S., Bhagulpore.
Chapman, R. B. Esq., B. C. S., Calcutta.
Colvile, Hon'ble Sir J. W. Kt., Calcutta.
Colvin, B. J. Esquire, B. C. S., Calcutta.
*Colvin, J. H. B. Esq., B. C. S., Europe.
Cowell, E. B. Esq., Calcutta.
Crozier, W. Dr., B. M. S., Calcutta.
*Cust, R. N. Esq., B. C. S., Europe.
Dalton, Capt. E. S. 9th Regt. B. N. I., Chota Nagpur.
*De Bourbel, Lt. R. Bengal Engrs., Europe.
Dickens, Capt. C. H., Calcutta.
Drummond, Hon'ble E., B. C. S., Calcutta.
Eatwell, Dr. W. C. B., Calcutta.
*Edgworth, M. P. Esq. B. C. S., Europe.
Elliott, Hon'ble W., M. C. S.
Ellis, Major R. R. 23rd Regt. B. N. I., Bundlekund.
Elphinstone, Lieut. N. W. 4th Regt. B. N. I., Goorgariah.
Erskine, Major W. C. Commr. of Saugur, Nurbudda Territories, Jubulpur.
*Falconer, Dr. H., F. R. S., B. M. S., Europe.
Fayrer, Dr. J., B. M. S.
*Freeling, G. H. Esq., B. C. S., Europe. Since returned.
Fytche, Major A. 70th Regt. B. N. I., Bassein.
*Gladstone, W. Esq., Europe.
Govinchunder Sen, Bábu, Calcutta.
Grapel, W. Esq., Calcutta.
Gray, J. J. Esq., Maldah.
Grote, A. Esquire, B. C. S., Calcutta.
*Gubbins, C. Esq., B. C. S., Europe.
Hall, F. E. Esq. M. A., Saugur.
Halsey, W. S. Esq., B. C. S., Gurruckpore.
*Hamilton, R. Esq., China.
Hamilton, Sir R. N. E. Bart., B. C. S., Indore.
Hannyngton, Lieut.-Col. J. C. 24th Regt. B. N. I., Berhampore.
Hearsay, Major Genl. J. B., K. C. B. 10th Light Cavalry, Barrackpore.
Herschel, W. J. Esq. B. C. S., Jungipore.

*Hichens, Lieut. W. Bengal Engineers, Europe.
Hodgson, B. H. Esq. B. C. S., Darjiling. Since gone to Europe.
Hossein Ally Mohamed, His Highness Ex-Ameer of Scinde, Calcutta.
Ishureepershad, Rajah, Benares.
*Jackson, L. S. Esq., Europe.
*Jackson, W. B. Esq. B. C. S., Europe.
Jadava Krishna Sinhâ, Bábu, Calcutta.
James, Capt. H. C. 32nd Regt. B. N. I., Darjiling.
Jenkins, Lieut.-Col. F., Assam.
Jerdon, T. C. Esq. M. M. S.
*Johnstone, J. Esq., Europe.
Joygopaul Bysack, Bábu, Calcutta.
Kabeeroodeen Ahmed Shah, Bahadoor, Sassaram.
Kay, Rev. W., D.D., Bishop's College.
*Laidlay, J. W. Esq., Europe.
Layard, Capt. F. P. 19th Regt. B. N. I., Berhampore.
Lees, Captain, W. N., 42nd Regt. B. N. I., Calcutta.
Liebig, Dr. G. Von, B. M. S., Calcutta.
Loch, G. Esq. B. C. S., Calcutta.
*Loch, T. C. Esq. B. C. S., Europe.
Loftie, Lieut.-Col. M. E.
Low, Major Genl. Hon'ble J., Calcutta.
*Lushington, F. A. Esq. B. C. S., Europe.
Maclagan, Capt. R., N. W. Provinces.
Macleod, D. F. Esq. B. C. S., Lahore.
Macrae, Dr. A. C., B. M. S., Calcutta.
Manickjee Rustomjee, Esq., Calcutta.
*Marshman, J. C. Esq., Europe.
*Middleton, J. Esq., Europe.
Medlicott, J. G. Esq., Calcutta.
*Mills, A. J. M. Esq. B. C. S., Europe.
Money, D. J. Esq. B. C. S., Calcutta.
Money, J. W. B. Esq. B. C. S., Calcutta.
Morris, G. G. Esq. B. C. S., Rungpur.
Morton, D. T. Esq., M. D., Moulmein.
*Muir, J. Esq., Europe.
Muir, W. Esq. B. C. S., Allahabad.

*Nicholls, Capt. W. T. 24th Regt. M. N. I., Europe.
Nogendranáth Tagore, Bábu, Calcutta.
Oldham, Prof. T., F. R. S., Calcutta.
O'Shaughnessy, Sir. W. B., Bombay.
*Ouseley, Major W. R., Europe.
*Phayre, Major A., Europe. Since returned.
Prasunnonáth Roy, Rajá, Bahadur, Degaputti, Rajshaye.
Pratt, the Venerable Archdeacon, J. H., Calcutta.
Pratápchandra Siñha, Rájá, Calcutta.
*Prinsep, C. R. Esq., Europe.
Prasannacumár Tagore, Bábu, Calcutta.
Rádhánáth Sikdar, Bábu, Calcutta.
Rajendrá Dutt, Bábu, Calcutta.
Rajendralâl Mittra, Bábu, Calcutta.
Rámánáth Bánnorjee, Bábu, Calcutta.
Ramánáth Tagore, Bábu, Calcutta.
Ramáprasad Roy, Bábu, Calcutta.
Rámchandra Siñha, Rájá, Calcutta.
Rámgopál Ghose, Bábu, Calcutta.
Riddell, H. P. Esq. B. C. S., Calcutta. Since gone to Europe.
Roberts, A. Esq. B. C. S., Jubbulpore.
Röer, Dr. E., Cuttack.
Rogers, Capt. T. E., Calcutta.
Row, Dr. J. B. M. S., Calcutta.
*Royle, Dr. J., F. R. S., Europe. Since dead.
*Russell, R. H. Esq., Europe.
Samuells, E. A. Esq., B. C. S., Patna.
Saxton, Capt. G. H. 38th M. N. I., Cuttack.
*Schiller, F. Esq., Europe.
Seton-Karr, W. Esq., Tirhoot.
Sherwill, Capt. W. S. 66th Regt. B. N. I. Dum-Dum.
*Smith, Col. J. T., Europe.
Smith, Rev. W. O., Calcutta.
Spankie, R. Esq. B. C. S. Saharunpore.
*Sprenger, Dr. A., Europe.
Stephen, Major J. G. 8th N. I., Raneegunge.
Strachey, Lt.-Col. R., Bengal Engineers, Calcutta.

*Strachey, J. E. Esq. B. C. S., Europe.
*Strong, F. P. Esq. B. M. S., Europe.
Satyasharana Ghosal, Rájá, Calcutta.
*Thomas, E. Esq., B. C. S., Europe.
Thomson, Dr. T., M. D., F. R. S., Botanical Gardens.
Thornhill, C. B. Esq. B. C. S., Nynee Tal.
Thuillier, Major H. L., Artillery, Calcutta.
Thurnburn, Capt. F. A. V. 14th Regt. B. N. I., Oude.
Trevor, C. B. Esq. B. C. S., Calcutta.
Ward, J. J. Esq. B. C. S., Cuttack.
Watson, J. Esq., B. C. S., Berhampur.
Waugh, Col. A. S., Bengal Engrs., Derra Dhoon.
Wilson, The Right Rev. D., Lord Bishop, Calcutta. Since dead.
Woodrow, H. Esq., Calcutta.
Young, Capt. C. B. Bengal Engrs., Calcutta.
Yule, Major H. Bengal Engrs. Calcutta.

ELECTED IN 1857.

H. F. Blanford, Esq., Calcutta.
E. B. Cowell, Esq., Calcutta.
Joygopaul Bysack, Bábu, Calcutta.
Dr. W. C. B. Eatwell, Calcutta.
Rájá Prasunonauth Râyâ, Bahádur, Degaputti, Rajshayee.
Dr. W. Crozier, B. M. S., Calcutta.

LOSS OF MEMBERS DURING THE YEAR 1857.

Withdrawn.

Dr. A. Christison, Gwalior.
Lieut. R. Stewart, Cachar.
Dr. W. Martin, Calcutta.
Rev. K. M. Banerjee, Calcutta.
J. W. Sherer, Esq., Allighur.
P. W. LeGeyt, Esq., Calcutta.
J. Willis, Esq., Calcutta.
D. G. Nicholson, Esq., Moulmein.
J. F. Curtis, Esq., Calcutta.
A. R. Young, Esq., Calcutta.

W. G. Young, Esq., Calcutta.
Dr. F. J. Mouat, Calcutta.
Lieut. H. S. Forbes, Artillery, Benares.
Major J. C. Haughton, Moulmein.

By Death.

G. A. Bushby, Esq., Gwalior.
S. G. T. Heatley, Esq., Delhi.
M. C. Ommanney, Esq., B. C. B., Lucknow.
D. Grant, Esq. B. C. S., Futteghur.
Capt. F. C. C. Hayes, 66th Regt. B. N. I., Lucknow.
Dr. G. G. Spilsbury, Calcutta.
Dr. H. Walker, Europe.
Col. Sir H. Lawrence, Oude.
Barlow, Sir R., Bart, B. C. S., Europe.
Hon'ble J. R. Colvin, Agra.
Captain R. B. P. Byng, 62nd Regt. B. N. I.,
C. W. Cunliffe, B. C. S. Lucknow.

Honorary Member.

Baron Von Hammer-Purgstall, Aulic Counsellor, Vienna.

List of Honorary Members.

M. Garcin de Tassy, Membre de l' Instit, Paris.
Sir John Phillippart, London.
Count De Noe, Paris.
Prof. Francis Bopp, Memb. de l' Academie de Berlin.
Sir J. F. W. Herschel, F. R. S. London.
Col. W. H. Sykes, F. R. S. Do.
General Count Ventura, Europe.
Prof. Lea, Philladelphia.
Prof. H. H. Wilson, F. R. S., London.
Prof. C. Lassen, Bonn.
Sir G. T. Staunton, Bart., F. R. S., London.
M. Reinaud, Memb. de l' Instit, Prof. de l' Arabe, Paris.
Dr. Ewald, Gottingen.
His Highness Hekekyan Bey, Egypt.

Right Hon'ble Sir Edward Ryan, Kt., London.
Prof. Jules Mohl, Memb. de l' Instit, Paris.
Col. W. Munro, 39 Regt.
His Highness the Nawab Nazim of Bengal, Murshedabad.
Dr. J. D. Hooker, R. N., F. R. S. London.
Prof. Henry, Princeton, United States.
Lt.-Col. Sir H. C. Rawlinson, K. C. B., London.
Lt.-Col. Sir Proby T. Cautley, K. C. B., London.
Rájá Rádhákánta Devá Bahádur, Calcutta.

Corresponding Members.

Kremer, Mons. A. Von, Alexandria.
Porter, Rev. J., Damascus.
Schlagintweit, Mons. H.
Schlagintweit, Mons. A.
Smith, Dr. E., Beyrout.
Tailor, J. Esq. Bussorah.
Wilson, Dr., Bombay.
Nietner, J. Esq., Colombo, Ceylon.

Associate Members.

Blyth, E. Esq., Calcutta.
Káramt, Ali Syud, Matawalli, Hooghly.
Long, Rev. J., Calcutta.
MacGowan, Rev. J., Ningpo.
Piddington, H., Esq., Calcutta.
Stephenson, J. Esq. Europe.

For February, 1858.

At a monthly General Meeting of the Asiatic Society held on the 3rd instant.

Major H. L. Thuillier, Senior Member present, in the chair.

The proceedings of the December meeting were read and confirmed.

Presentations were received—

1.—From the Government of Madras, copies of Selections from the records of the Government.

The Secretary stated that these publications had been sent, in compliance with a request made by the Council, who were glad to announce that the Government of Madras have ordered that the Society should be supplied with all the Selections that may hereafter be published.

2. From Mr. C. Joseph, a copy of his new map of the country, from Calcutta to Lahore, shewing the course of the rail, and the Grand Trunk Road.

3. From the Principal of the Grant Medical College Bombay a copy of the Report of the Grant Medical College, for the Session 1856-57.

4.—From the Secretary to the Government of the Central Provinces, a plan of the Village and Fort of Bilhere.

5.—From Captain Hill, Bankshall, through Mr. Piddington, a Dayak Coin from Tringam, Coast of Borneo.

Recorded a note from B. H. Hodgson, Esq., C. S. announcing his departure for England, and another from Mr. C. Gubbins, C. S. announcing that being about to retire from the Service, he wished his name to be removed from the list of paying members.

The Council submitted a report announcing, that they had appointed the following Sub-Committees.

Finance.

Dr. T. Boycott.
Captain C. H. Dickens.

PHILOLOGY.

A. Grote, Esq.
E. A. Samuells, Esq.
Rev. J. Long.
F. E. Hall, Esq.
E. B. Cowell, Esq.
Dr. E. Roër.
Captain W. N. Lees.
Baboo Rajendralal Mittra.

LIBRARY.

E. A. Samuells, Esq.
W. Grapel, Esq.
Baboo Ramapersad Roy.
Lieut.-Col. R. Strachey.
Baboo Rajendralal Mittra.
Captain W. N. Lees.
Captain C. H. Dickens.

NATURAL HISTORY.

E. A Samuells, Esq.
T. Oldham, Esq.
Dr. T. Thomas.
Dr. T. Boycott.
Captain C. B. Young.
Lieut.-Colonel R. Strachey.
H. F. Blanford, Esq.

METEOROLOGY AND PHYSICAL SCIENCE.

The Venerable J. H. Pratt.
Major H. L. Thuillier.
Dr. Von Liebig.
Lieut.-Colonel R. Strachey.
H. Piddington, Esq.
Baboo Rada Nauth Sikdar.

The election of Monsieur R. Schlagintweit as a corresponding member of the Society was deferred under rule 6 of the bye-laws.

Baboo Kaliprosono Sing, duly proposed and seconded, at the December meeting, was declared elected.

Communications were received.

1.—From Baboo Rada Nauth Sikdar, forwarding abstraets of the Meteorological Register kept at the office of the Surveyor General, Calcutta, for August and September last.

2.—From Dr. Campbell, Darjiling, through Major Thuillier, copy of a Register of the Temperature of the Ocean, with the chart of the voyage of the "Agamemnon" shewing the daily position of the ship at noon, from the Sandheads of the Hooghly, to the river Thames.

3.—From Mr. Oldham, a notice of the recent additions to our knowledge of the Cretaceous Rocks of India.

The paper was read by the Secretary and the thanks of the meeting were accorded to the Author.

Some Terracotta sculptured slabs which Captain Yule had received from Ava, were at his request exhibited to the meeting, and excited considerable interest.

The librarian submitted his monthly reports for December and January last.

The following is Mr. Oldham's paper.

On some additions to the knowledge of the Cretaceous rocks of India. By Thomas Oldham, *LL. D., F. R. S., M. R. I. A., F. G. S. &c., Superintendent of the Geological Survey of India.*

At the meeting of the Society for the month of May 1857, Mr. Henry Blanford and myself were present, with the intention of laying before the Society, a brief notice of a very important discovery bearing on the Geology of India which had not long previously been made. This was the fact of the occurrence of rocks of the Cretaceous epoch in the western portion of the Nerbudda district. And the specimens illustrative of the intended communication were laid on the table. The attention of the meeting on that occasion, having been fully occupied by other matters of interest, and importance, which came before it, time did not allow of this geological communication being brought forward, and as both Mr. Blanford and myself shortly afterwards left Calcutta, the subject was not again brought before the Society. I am, however desirous of recalling these facts, from the circumstance that the same discovery has subsequently been brought forward elsewhere,

and I desire to place on record the facts of the case, more fully than has hitherto been done, that the friend whose zeal first led to the discovery may be rewarded by obtaining full merit for his intelligent research.

All those who have given any attention to the study of Indian geology, are aware that previously to last year, rocks of the cretaceous epoch, were only known to occur, in the South of the Indian Peninsula, forming a band, the limits of which were supposed to be near Trichinopoly on the South, and near Pondicherry on the North. The true relations of this band of cretaceous rocks, have never been fully investigated, but a very beautifully preserved, and numerous suite of fossils had been collected from them by Messrs. Kay and Brooke Cunliffe, of the Madras Civil Service, which were presented to the Geological Society of London. The description of these fossils was undertaken by the late Professor Edward Forbes, and a most valuable and instructive memoir, fully illustrated with excellent plates, was published in the 3rd part of the 7th vol. of the Geological Transactions, London.

After giving a detailed description of the species found, Professor Forbes entered on a discussion of the inferences to be drawn from the Fauna thus represented. It must be borne in mind that previously to this publication, the occurrence of any rocks, representatives of the cretaceous epoch in India, had often been denied, and that there was no fixed geological horizon to which such a new discovery could be referred. The physical relations of the rocks containing the fossils to any other recognised groups were unknown, and it was only from a discussion of the organic remains contained in them, that any just inference as to their geological age could be attained.

Professor Forbes entered fully into this discussion, and from a careful analysis of all the evidence arrived at the conclusion, that all the beds from which fossils had been obtained were parts or members of one and the same series, and that that series was equivalent to the cretaceous series of Europe; the deposits at Trichinopoly and Verdachellum, being probably equivalent to the upper greensand and gault divisions of that series; the deposit near Pondicherry, being equivalent to the Neocomien, or lower greensand.

During a brief visit to Madras in the autumn of 1856, I was indebted to the kindness of Mr. Brooke Cunliffe, one of the original labourers at these deposits, for a valuable collection of these fossils chiefly from the Utatur locality. This collection at once proved the correctness of the closing words of Professor Forbes' valuable paper that "Verdachellum and Trichinopoly will doubtless yield many more species than have yet been brought to Europe," for in it were many beautiful and well marked forms previously undescribed. But it also showed conclusively, that a still further and more careful research was requisite, before it could be supposed that anything like fair data had been obtained, for arriving at trustworthy conclusions as to the true character of the Fauna of this period in Southern India. The relative abundance of species, and even of genera seemed in many respects very different from that which the original collection gave, and it appeared *probable* that much of this difference in different localities was the result of a difference in depth of the sea at the time of deposit, and not of difference in time—a result not in accordance with the conclusions arrived at by Professor Forbes.

Among the small collection presented by Brooke Cunliffe, Esq. not less than 93 species were distinguished. Of this large number only 33 were known to Professor Forbes from the original collection; leaving an addition to the Fauna known up to that time from these rocks of 60 species. Without exception these 60 species all tended to confirm the opinion of Forbes, that these rocks were of cretaceous age. A summary is given below of these additions generically, reserving the details of specific description until it is possible to prepare illustrations of the fossils. But a group or two may be referred to, in illustration of our remarks. Thus, taking the several well marked sections of the great genus *Ammonites*, among the large addition to the known catalogue of species, which Mr. Cunliffe's collection has given, we have none of the *Fimbriati*, an oolitic and cretaceous section; none of the *Flexuosi*, also a lower cretaceous section; none of the *Dentati*, also lower cretaceous; none of the *Armati*, an upper oolitic section; none of the *Lævigati;* while on the other hand of the *Cristati*, a section essentially cretaceous, we find one; of the *Clypeiformi*,

also a cretaceous section, one: of the *Heterophylli* five, and *all* of the cretaceous subdivision of this section; of the *Ligati*, a group essentially cretaceous, not less than ten.

Of *Nautilus*, a genus having a larger development in the upper, than in the lower beds of the cretaceous, we have three allied to other cretaceous forms; of *Belemnitella*, confined to the upper portion of the cretaceous group, one. And other instances might be given. These will however suffice to shew, that a vast addition to the cretaceous Fauna of India still remains to be worked out.

I would add that Mr. H. F. Blanford, with others, is at present engaged in making out the relation of these rocks, and I confidently anticipate, that much light will be thrown upon the subject, by the careful examination of the Officers of the Geological Survey in that district.

Abstract of fossils from Utatur near Trichinopoly.

	Species previously known.	Species unknown.
Zoophyta.		
Turbinolia,		
Echinodermata		
Brissus,	3	2
Nucleolites,	0	1
Holaster,	0	1
Crustacea.		
Cancer (?)	0	1
Mollusca. (*Acephala.*)		
Inoceramus,	0	3
Pecten,	2	0
Ostrea,	0	4
Gryphœa,	2	1
Pinna,	0	2
Arca,	0	4
Pectunculus,	0	1
Modiola,	1	1
Trigonia,	1	1
Solecurtus,	0	1
Cardium,	0	2

	Species previously known.	Species unknown.
(Gasteropoda),		
Natica,	1	0
Trochus,	1	0
Pleurotomaria,	1	0
Voluta,	2	0
Phasianella,	0	1
Strombus,	1	0
Tornatella,	1	0
(Cephalopoda)		
Baculites,	2	0
Ptycoceras,	0	1
Hamites,	5	4
Turrilites,	1	1
Ammonites,		
Cristati,	0	1
Lœvigati,	1	0
Clypeiformi,	0	1
Heterophylli,	1	5
Ligati,	3	10
Nautilus,	1	3
Belemnites,	0	2
Belemnitella,	0	1
Annelida.		
Serpula,	0	2
Pisces.		
Odontaspis,	1	0
Otodus,	2	0
Lamna,	0	1

The above list refers solely to the collection of fossils presented to the Geological Museum by Brooke Cunliffe, Esq.

Nerbudda District.—During the season of 1855-56, while engaged in the examination of the valley of the Nerbudda, I had the pleasure of meeting Captain R. H. Keatinge, Assistant Political Agent for Mewar, at Poonassa. Among other things our conversation turned upon the coralline limestone, of which the ancient town

of Mandoo had been built. I took the opportunity of pointing out the extreme interest attaching to this limestone in a geological point of view, and the utter ignorance under which we rested as to its age or relations. It had been very ingeniously, and correctly inferred by Dr. Carter, in his carefully compiled "Summary of the Geology of India," that this limestone used at Mandoo had been derived from near Baug or Bagh, which inference I pointed out to Captain Keatinge in Dr. Carter's paper, telling him at the same time my own impression that it would prove to be, not oolitic, as provisionally supposed by Dr. Carter, but of the nummulitic age. I strongly urged Captain Keatinge to visit the locality indicated, and to collect any fossils that might be found, feeling confident, that it would yield a rich harvest of many forms other than corals. I felt sure that it was only requisite to point out to this enlightened officer, the interest of the enquiry, to secure his zealous co-operation. Nor was I disappointed. In a letter dated Nov. 4th, 1856, after stating that he had been prevented from getting out much sooner, as he had intended, he says: "I started West, without, however, the least idea of where I was going to. I got out 20 miles to Kala Bowli all well. I mounted at $\frac{1}{4}$ to 1 P. M., to go to Cheera Khan, which name sounded well. It was distant 8, 10, 5, 14 coss, as you pleased. Early in the afternoon I got it down to 3 coss, but alas I rode until after dark, and it was still 3 coss, and is 3 coss now I believe, at least I never get any nearer. * * * I talked to the Bheels about black stone, until I succeeded in making them say that I should find white, which consoled me much. * * * * From the information I got I started the next morning in a S. W. direction for Deola, on the Maan river. After going a coss I saw the limestone in the bed of a nullah, and in a coss more I was in the midst of it. Where I was (near Deola) the limestone lay in a valley about a mile broad. N. and S. the country was all hilly, the top of the hills covered with trap; and the bed of the Maan trap. I could make nothing of the general geological arrangement. In the valley the limestone was horizontal, on the hill sides it always seemed to slope down hill, but it may have been merely that the slabs had fallen one over the other. But the fact is, I had only two days to work in, and occupied them in collecting fossils.

"Higher up at Surbaperce on the Maan, I thought I traced the following succession, (ascending) a light green stone metamorphic or volcanic; a soft sandstone, very fine grained and white; compact limestone, bluish white; and then the coral limestone, the latter only containing corals. The compact fine limestone, is found at intervals all over the jungle, and has been very largely used for lime in the Mandoo days; the old kilns are without number. Now as to the fossils, I found them wherever an edge of stone lay over a convenient mud bed to retain them; and oh! the spear grass!! &c. &c. The *Echinida (Micraster coranguinum*)* were in great plenty (the Bheels call them Paunchia from their five marks) and what I suppose to be *Pecten 5-costatus*.† *Plagiostoma spinosum* and *Terebratula octoplicata* were numerous, the latter the most numerous and in best preservation. There are a good many other things too you will find in the box I have to day posted for you. There are pieces of a large finely marked *Echinus (Cidaris)* and I have a half one of the same sort of which I send you a sketch. I have kept it to show the natives what I want on some future occasion. There is also a rude impression on a stone I have got, of a very large shell, say six inches long.‡

"I have kept half the fossils to shew Mr. Blackwell, but you will find some nice small ones wrapped separately in paper."

On receipt of these fossils, they were at once looked to, and it was found that although some of these specific distinctions were not correct, they entirely supported the conclusions of Captain Keatinge; and that here to the West of Mhow and Indore, in a country where such was before altogether unknown, there existed extensive beds of the cretaceous series. The importance of this fact, in its bearing on all reasonings as to the physical geography of the country at former periods, will be obvious to every one who has considered such questions, and its influence on the question of the still doubtful age of the rocks in the adjoining district was also great. Eagerly therefore I congratulated Captain Keatinge on his valuable discovery, and urged a further exploration of the field. And I had the pleasure of hearing the result in the beginning of the

* This is a *Brissus*. † It is so. ‡ *Inoceramus?*

year. (March 1857.) Captain Keatinge had, in company with Mr. Blackwell, Mineral viewer to the Bombay Government, revisited the Baug district in the month of January, and has favored me with an extract from his journal, which being brief, and full of interest, I give entire.

Extracts from Captain Keatinge's Journal.

14*th January*, 1857.—From Mundlaisir marched 15 miles to Khul, where the Bombay and Agra road crosses the Nerbudda.

15*th*.—Passed by Dhurmpooree, and on to Tolie, a small village in the jungle.

16*th*.—Munawer a town on the river Maan, west of the town is a small temple in a field, some of the pieces of limestone of which it is composed are a mass of shells.

17*th*.—To Dherree a large village on the Ourie river. All about Dherree the country is composed of a Breccia of trap, with some limestone and sandstone pieces amongst it, some of them are a little rolled but the most are angular. From Mundlaisir to Dherree, all the country is of trap with no jungle, except a small babool scrub and uninteresting.

18*th*.—To Baug, the Breccia continuing most of the way. Some three or four miles from Baug, sandstone is seen in the bed of a nullah, but the high land about is all trap. About two miles out of Baug, the sandstone commences, it is of a light pink colour easily broken up, and the plain is covered with silicious sand from it; in the bed of the stream, we found pieces of black shale which on exposure to strong heat, bubble up into a slag, and on being left in a wood fire for some hours, turn light grey; we could trace no vegetable impressions in them.

19*th*.—To see the iron ore, first proceeded east of the town some four miles, and came to the last works which were carried on some 16 or 20 years ago. The ore lies in the body of a small hill, and has been most extensively quarried, it is a light yellow ore like that of Nandia, near Burwah, and of Nancoot, but in far greater masses than any I have seen at those places, and has been most extensively worked. The deepest mine we went into measured 48 feet from top to bottom, and was about double that width. Quite close to the ore is a large hill of limestone, but so hard and deep blue that I was

certain it was a trap, or metamorphic stone; on burning, however, it turned out a beautiful lime. Near the town are numbers of small pits and burrows, but no large mines like those to the east.

20th.—In the morning went to see the caves, the figures in them very fine and imposing, as seen by torch-light, and the situation very lovely; the Baugun river seems to have no single fall, but a continued rapid descent; the cliff in which the caves are situated consists of a mass of sandstones of all colours, sloping up to the N. E. at a slight angle, and topped with a very hard and white friable limestone, in which we found some shell impressions. About five miles from Baug to the east of the Noonsee Road, is a quarry of white sandstone, an even bedded and soft stone, which is still carried a long distance for building purposes, it seems to be near the bottom of the mass of sandstone. In the evening rode out towards Cheeklee and Rajpoor, some 5 or 6 miles.

21st.—This morning to the village of Auggur, N. E. of Baug, where iron has been very largely worked. Ore in great abundance, also the hard grey limestone. All about Baug E. and west is a bed of shales, which seem to be nearly vertical, dipping to the S. or S. W. at a very steep angle, the ore seems generally to be in them.

22nd.—Rode out along the road to Cheeklee, west of Baug to the village of Mogra, about ten miles distant. At about 6 miles, found trap covering sandstone, up to that, the country having shewn nearly alternately sandstones and limestones. In the afternoon leaving Mogra, we went nearly north to the village of Kharrwa, and from that E. to Baug seeing limestones and sandstones all the way, except one hill capped with trap.

23rd.—Left Baug by the same road as entered it from Dherree but struck off to the N. E. from the second village; soon got into the trap again, with sandstones under it. About half way to Bulwarrie in the Ourie Nulla, near the village of Khojakoa, found a considerable thickness of sandstones, dipping to the North and thickly covered with trap. Near Bulwarrie saw some curious metamorphic rocks, looking rather like granite; at Bulwarrie itself all seemed trap.

24th.—Marched to Kutchkonda. Up to half way all seemed trap, but after that we got into the coral limestones, and continued

through them to Kutchkonda. A good deal of stone has been quarried in a superficial way at this place both to the north and east, the quarried stone lies just under trap. In the evening rode East some four miles, to see a fall in the River Maan ; the fall is near the village of Neemkhera, and is caused by a barrier of trap, the height from 18 to 20 feet, according to the place it is taken from. A considerable quantity of water was going over it in four streams. Between the fall and Kutchkonda, the river exposes a considerable thickness of crystalline limestones and shales in thin beds, dipping considerably to the N. E. and at Kutchkonda is a gritty shale, used by the barbers of all Nimar as a honestone.

25*th.*—Viâ Cheerakhan, (meaning "cut-stone quarry") to Deora. The former is evidently the place from whence cut-stone went to Mandoo, and is so remembered traditionally. There are two small mosques in the Mandoo style, built by the workmen of the olden days. The quarries lie on the top of low hills, and have been quarried along the top in a layer of about four or five feet, no where apparently deeper. The rock is here not covered with trap. The amount of stone that has been quarried is very large. From Cheerakhan to Deora, the country is all limestone. A mile or two out of Deora, passed what appeared to be a fossil trunk of a tree lying on the road ; and about half a mile out, a bed of thin shales dipping to the north. The thick limestone seems nearly horizontal. At Deora found that the people had collected a good many fossils.

26*th.*—In the morning for several hours fossil hunting ; found some new ones, and saw a bank that appeared to contain more, and in which many were found in the evening. The fossil bed is composed of a clay, usually yellow, with some red and white veins in it, and with about a foot of compact limestone over it, the bed is intersected by a stream, and shows best near the village of Odeypoor : near it is also a bed of very friable limestone, looking exactly like that over the caves at Baug, but containing Echini and some small shells.

27*th.*—In the morning marched east, some six miles to the Village of Putlowed, a deserted site on high ground near a small stream. The bed of the stream was all trap, but a number of echini were distributed in the gravel of its bed, showing that it must pass

through a fossil deposit. From thence to Baccaneer south six miles, and so into Mundlaiser."

From these details it will be evident that to Captain Keatinge alone is due the merit of having first distinguished these fossils as cretaceous, and to him also belongs the merit of having most zealously and under considerable difficulties, collected a very tolerable series of them.

I have taken this opportunity of recording the facts above given, more especially because in the last number of the Journal of the Bombay Branch of the Royal Asiatic Society, there is a notice regarding some fossils from the same locality, in which the discovery of these most interesting fossils, and their identification as cretaceous, is not fully assigned to Captain Keatinge. And I desire to reclaim for that most active and enlightened officer, the fullest award of credit which his exertions deserve. I do this the more anxiously also, because unexpected circumstances had prevented our doing so at the earliest opportunity, as intended, so long since as May last, the last of the fossils having only reached me a few days previously.

I shall not here discuss the conclusions arrived at by Dr. Carter in the notice referred to,* that these beds are truly neocomien, because I think we have not got any sufficient data to reason upon, I feel confident that the hasty reference of any group of rocks, to some acknowledged European *subdivision* based upon the occurrence of 3 or 4 ill-preserved and ill-identified fossils is both unphilosophical and injurious. The evidence here is abundantly good to say that these rocks represent the cretaceous era, but altogether insufficient to enable one to refer them to any subdivision of that great series.

Reserving, as before, the detailed specific description of these fossils, a generic summary is here given of the number, &c.

Summary of Fossils collected at Baug by Captain Keatinge.

Corallines	4 or 5 species	Species.
Echinodermata.	Cidaris,..............................	1
	Echinus, (species)	1
	Brissus, ...	2 or 3

* Journal Bombay Asiatic Society, No. XX. July 1857, page 621.

	Cyphosoma, ...	2
Mollusca.	Acephala Pholadomya, ...	1
	Venus, ...	1
	Cardium, ...	4
	„ *altum. Sow; hillanum, or very closely allied and two others.*	
	Arca,............................	1
	Modiola, ...	1
	Mytilus, ...	1
	typicus, Forbes.	
	Pecten (Janina)	3
	P. (5. *costatus* common.)	
	Plicatula, ...	1
	Inoceramus,........................	1
	Terebratula,.......................	1
Gasteropoda.	Rhynconella, ...	1
	Natica, ...	1
	Turritella, ...	1
	Cerithium, ...	1
	Triton, ...	1
	Voluta,...........................	2
Cephalopoda.		
	Ammonites of the *Rhotomagensis* Section,	2

I had hoped to have procured during the past summer an extended series of fossils from this locality, and with a view of having it thoroughly examined, Mr. Wm. Theobald, Junr. was deputed to remain in that district, after his field work of last season had been concluded in the Nerbudda Valley. But the very disturbed state of all the country in that neighbourhood has rendered it impossible to carry out these views. Mr. Theobald, after considerable risk has escaped unhurt, but the examination of the Bagh country, must be deferred to a more favourable opportunity.

I would merely add that a brief notice of the discovery of the fossils, was communicated to the Madras Literary Society, on February 12th, 1857, and published in their Journal No. 2, New Series, and also that I took the opportunity of a brief communication on some points of Indian Geology, made to the British Association for

Advancement of Science, at their meeting in Dublin during the past year, to place on record, the claims of Captain Keatinge as the first who had made out these fossils.*

Library.

The following additions have been made to the Library during the months of December 1857 and January, 1858.

Presented.

Selections from the Records of the Government of Madras the following Nos.—By the Government of Madras.

1854.

No. 1. Report on the Navigation of the Godavery.
3. Ditto on the Proposed abolition of the Madras Mint.
4. Ditto on the Paumban Channel.
8. Proposed plan for the Revenue Assessment of Kurnool, 1843.

1855.

4. Major Maitlaard's School for the instruction of the Artificers and Pupils at the Gun Carriage Manufactory.
7. Ditto on the Civil Dispensaries, 1853.
12. Reduction on the Revenue Assessment in North Arcot.
14. Report on the Medical Topography of the South Western Political Districts.
17. Ditto on Public Instruction in the Madras Presidency for 1854-55.
19. Ditto on Ports and Harbours of the Northern Circars.
20. Ditto on Vaccination in Madras, 1854.
21. Ditto on Civil Dispensaries, 1854.
22. Papers relating to the Revision of Land Revenue Assessment in South Arcot.
23. Reports on the Fibres of Southern India.
24. Ditto on the Disturbances in Purla Kimedy, Vizagapatam and Goomsoor in 1832-36, 2 Vols.
26. Papers relating to the establishment of Village Vernacular Schools in the Sub-Division of Rajamundry.
27. Report relating to the Budget of 1854-55.
28. Ditto ditto of Public Works, for 1855-56.
29. Replies to the collective Memorandum on Public Works in the Madras Presidency.

* An abstract of this communication was republished in the Edinburgh New Phil. Journal, No. 12, New Series, page 320.

30. Report on District Roads, for 1854.
31. Papers relating to the commutation rates of the Madras Presidency.
32. Report of a Committee on a plan for cleansing the drains of Black Town.

32*a* or 33 Ditto of Agricultural Exhibitions in the Provinces in 1856.

33. Report on Vaccination for 1855.
34. Ditto on Civil Dispensaries for 1855. 2 Copies.
37. Correspondence on the scale of Passenger Fares and Goods Tariff for the Madras Railway, Parts I. and II. in one Vol.
38. Papers relating to the Budget of Public Works for 1856-57.
41. Report on Grants-in-aid of Schools unconnected with Government
42. Ditto on Vaccination for 1856.
43. Correspondence on the scale of Passenger Fares and Goods, Tariff for the Madras Railway, Vol. II.

A Map of the Country from Calcutta to Lahore shewing the route of the Rail and the Grand Trunk Road.—By C. Joseph, Esq.

Report of the Grant Medical College for the session 1856-57.—By the Principal of the College.

Selections from the Records of the Government of India, No. XXIV. Report on the Guicowar's Hospital.—Notices on Karen Nee.—Jubbulpore School of Industry—Statement of Criminals disposed of by the Thuggee Department—and Survey of the Andamans.—By the Government of India.

Nabâ Prabundhû Sará, or Moral and Entertaining Essays in Bengali, for the use of Colleges and Schools in Bengal, by Mohendrânâth Roy, 12mo. Calcutta.—By the Author.

Selections from the Bengali Poets, Part II. 12mo. compiled by ditto.—By the Same.

Half-yearly Report of the Committee to the Bengal Chamber of Commerce, Calcutta, 31st October, 1857.—By the Chamber of Commerce.

The Journal of the Bombay Branch of the Royal Asiatic Society, No. XX. July, 1857.—By the Bombay Asiatic Society.

Journal Asiatique, Nos. 36, 37, and 38, 1857.—By the Royal Asiatic Society of Paris.

Gelehrte Anzeigen, Nos. 38 and 39.—By the Royal Academy of Science at Munich.

Abhandlungen, der Historischen classe, Band VII. Abth. 2.—By the Same.

———— der Mathematisch-Physikalischen classe, Band VII, Abth. 2.—By the Same.

——— für die kunde des Morgenlandes, Von Dr. F. Windeschmann, 1 Band, No. 1, *Liepzig, pamphlet.*—By the Same.

Pflagraf Rupert der Cavalier, *Munich, pamphlet.*—By the Same.

Die Classischen studien und ihre Gegner, *Munich, pamphlet.*—By the Same.

Ueber das Klima von Munchen, *pamphlet.*—By the Same.

Transactions of the Royal Society of Edinburgh, Vol. XV.—By the Society.

Address delivered at the Anniversary Meeting of the Geological Society of London, on the 20th February, 1857. By the President, Col. Portlock.—By the Author.

The Calcutta Review, No. 63.—By the Proprietors.

The Oriental Christian Spectator for Nov. and Dec. 1857.—By the Editors.

The Calcutta Christian Observer for December, 1857 and January, 1858.—By the Editors.

The Oriental Baptist for ditto ditto.—By the Editor.

The Mutinies, the Government, and the People by a Hindu, *pamphlet.* —By the Author.

The Quarterly Journal of the Geological Society, No. 52, November, 1857.—By the Society.

Calcutta Monthly Review, Vol. I. No. I.—By the Editor.

Discours on Hindoostan, by Garcin de Tassy.—By the Author.

Meteorological Tables of Hobert Town for October and November, 1857. —By the Observatory in Hobert Town.

Vividhártha Suñgrahá, Nos. 43 and 44.—By Babu Rajendralal Mitter.

Exchanged.

The Athenæum for September and October, 1857.

The London, Edinburgh and Dublin Philosophical Magazine, Nos. 93 and 94 for October and November, 1857.

Annalen der Chemie und Pharmacie for August and September, 1857.

Purchased.

R. Jehuda Ben Koreisch Tiharetensis Africani ad synagogam judæorum civitatis Fez Epistola de studii Targum utilitate at de linguæ, &c. J. J. L. Bargès, *Paris,* 1857, *pamphlet.*

Le Bouddha et le Bouddhisme par C. Schœbel, *Paris,* 1857, *pamphlet.*

Max Muller's Rig-Veda, Part III. 4to. *Liepzig.*

American Journal of Science and Arts, Nos. 71 and 72, Vol. XXIV.

Annaire des Deux Mondes, VII. 1856-1857.

Annals and Magazine of Natural History for Oct. and Nov. 1857.

Annales des Sciences Naturelles, No. 6, Tome VI. and No. 1, Tome VII.

Edinburgh Review, No. 216 for October, 1857.

Literary Gazette, Nos. 2122 to 2130.

Journal des Savants, Sept. 1857.

Comptes Rendus, Nos. 9 to 15, 1857.

Revue des deux Mondes, 15th September, 1st and 15th October and 1st November, 1857.

Revue et Magasin de Zoologie, Nos. 8 and 9, 1857.

Natural History Review, No. 4, October, 1857.

Quarterly Review, No. 204, October, 1857.

GOURDA'S BYSACK.

Feb. 1858. *Librarian and Asst. Secy.*

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No. II. 1858.

Notes of the Karen Language.—By Francis Mason.

The Karens.

Karen is a Burmese word applying to the mountaineers of Pegu and Southern Burmah. It has been derived from *ayen*, foundation, and *ka* a form of particle; thus signifying aboriginal; and I find some of the Bghai tribes call themselves *kayay*, and this may be the origin of the Burmese word. It is, however, manifest that the Karens are not the aboriginal inhabitants of the countries where they now dwell.

In my early travels, the Karens pointed out to me the precise spots where they took refuge in the days of Alompra, and where they had come down and avenged themselves on their enemies; but when I asked them, "Who built this city?"—as we stood together on the forest-clad battlements of a dilapidated fortification,—they replied, "These cities of our jungles were in ruins when we came here. This country is not our own. We came from the north, where we were independent of the Burmese, the Siamese and the Talings, who now rule over us. There we had a city and country of our own near Ava, called Toungoo. All the Karens of Siam, Burmah and Pegu came originally from that region." When I asked for the time of their dispersion, they were silent. The fact was clearly before them, but the retrospect was too obscure to determine the distance. Yet they saw far beyond Toungoo. On the edge of the misty horizon was "The river of running sand," which their an-

cestors had crossed before coming. That was a fearful, trackless region, where the sands rolled before the winds like the waves of the sea. They were led through it by a chieftain who had more than human power to guide them ; and Sau Quala, when he first related the tradition, remarked that the whole story seemed to him like Moses guiding the children of Israel across the Red Sea and through the desert.

To what this river, or waters, of running sand referred, was quite an enigma to me for several years, till I met with the Journal of the Chinese Buddhist pilgrim Fa Hian, who came from China to India in the early part of the fifth century of the Christian era. He thus designates the great desert between China and Tibet. The governor of the "Town of Sands," he says, furnished his party with "the necessary means of crossing the River of Sand." "There are evil spirits in this River of Sand," he continues, "and such scorching winds, that whoso encountereth them dies, and none escape. Neither birds are seen in the air, nor quadrupeds on the ground. On every side, as far as the eye can reach, if you seek for the proper place to cross, there is no other mark to distinguish it than the skeletons of those who have perished there; these alone seem to indicate the route." Karen tradition says that the chieftain who led the party stretched out the staff in his hand as they crossed, from time to time, and stones rolled up in a path before them, to show the course they ought to take.

This emigration occurred about the time the Shans first settled in Labong and Zimmay ; because the tradition represents the chieftain to have come over first with an exploring party, and that they selected the region around Labong and Zimmay for their future home ; but when he returned with his nation, he found it occupied by the Shans.

The oldest of these cities is Labong, and, according to Dr. Richardson, Shan history states that that city was built A. D. 574 ; so this emigration of the Karens may have occurred some centuries after the commencement of the Christian era. Their traditions point unequivocally to an ancient connection with China ; for Tie or Tien is spoken of as a god inferior to Jehovah ; and offering to the manes of their ancestors is as common among the Karens as it is among the Chinese.

No further historical event has been found in their traditions till they impinge on Scriptural history at the dispersion of nations. The dispersion they represent to have arisen from want of love to each other and lack of faith in God, while the difference of language they attribute to the effect of the dispersion. Beyond this they have a tradition of the deluge, and then an account of the creation and fall of man coinciding so minutely with the statements of the Bible,—even preserving the names of Adam and Eve,—that they must have been derived from the written record since the days of Moses. Where, for example, do we find in the traditions of heathen nations that never saw the Bible, biblical facts so accurately stated as in the following stanzas?

"Anciently, God commanded, but Satan appeared bringing destruction.
Formerly, God commanded, but Satan appeared deceiving unto death.
The woman E-u and the man Tha-nai pleased not the eye of the dragon,
The persons of E-u and Tha-nai pleased not the mind of the dragon,
The dragon looked on them,—the dragon beguiled the woman and Tha-nai.
How is this said to have happened?
The great dragon succeeded in deceiving—deceiving unto death.
How do they say it was done?
A yellow fruit took the great dragon, and gave to the children of God;
A white fruit took the great dragon, and gave to the daughter and son of God.
They transgressed the commands of God, and God turned his face from them.
They transgressed the commands of God, and God turned away from them.
They kept not all the words of God—were deceived, deceived unto sickness;
They kept not all the law of God—were deceived, deceived unto death."

The absence, in all their traditions, of any allusion to any thing peculiarly Christian, proves that they never had the New Testament among them; and that, if derived from a written source, those traditions must have come from the Old Testament alone. The Karens themselves say they were obtained from their ancient books of skin, which are praised as teaching morals, in contrast with the palm-leaf books, that treat of things to make men wonder. A poetical fragment before me, that has never been published, says:

" The palm-leaf book that is written in circles,
The book of palm-leaf that in circles is written,
The elders drew out the lines in long coils;
They became great winding paths;
The letters of the palm-leaf books
Teach ancient wonders;
The pages of the palm-leaf books
Show wonders of antiquity.
God sent us the book of skin;
It is at the feet of the king of Hades;
God sent us the book that has neither father nor mother,
Enabling every one to instruct himself.
The book of one-sided letters, the letters ten,
Is at the feet of the king of Hades;
The book of one-sided letters, of letters many,
All men could not read."

It has been recently ascertained that there have been Jews in China from time immemorial; and five years ago the missionaries there obtained from a few Jewish families at Khai fung-fu several copies of the Pentateuch, the only part of the Bible they seem to possess. The manuscripts are described as "beautifully written without points, or marks for divisions, on white sheep skins, cut square and sewed together, about twenty yards long, and rolled on sticks." Had these Jews, or their proselytes, been thrown among Buddhist nations, lost their Pentateuch, and seen no more books of skin, but only palm-leaf books, what more natural than to sing dirges like the above over its removal to Hades?

Many of the Karens are quite tenacious in the belief that they formerly had books of their own. In the September (1855) num-

ber of the *Morning Star*, is an article from the pen of a native assistant on this subject. He says,—"Brethren, I wish to speak to you plainly concerning one thing. It is not true that the Karen nation had no books. The elders of past ages said, one generation to another,—'Children and grandchildren, the Karens had books, perfect like other nations.' But they did not take care of their books, and therefore lost them. When they lost their books, they lost their knowledge of God; and when they lost their knowledge of God, they could no longer live in peace with each other. The younger brother became an enemy, the elder brother a foe. The more they lived in hostility, the more degraded they became; the more degraded they became, the shorter the period of life; the shorter the period of life, the more they did evil; the more they did evil, the more severe were the judgments of God, afflicting them the more with sickness and death. But the elders left one promise. They said,—'Though the Karen nation has deteriorated and increased in wickedness, yet love and compassion will come to them again; when love and compassion come to them again, if they observe and do, they will fraternize again into populous communities; when they fraternize again into populous communities, they will love each other and improve physically and morally.' Again, the elders said: 'Children and grandchildren, if you are enticed towards that which is black, follow not; if you are enticed towards that which is red, follow not. They are not the words and commands of your God. Before the word of your God returns to you, many will come, saying they are your God; but they are not your God. Look towards the ocean. The great bird shall ascend and spread forth its white wings. That is the white foreigners bringing you the words of your great eternal God.' The elders added: 'If you observe the words of your great God, which the white foreigners bring to you, you shall become acquainted with the righteousness of your God, and be able to discriminate between right and wrong; and when you are able to discriminate between right and wrong, you will dwell together again in prosperous communities as in the olden time; but if you neglect to observe, then will you remain in the same degraded state you are now in.'

"The words of the elders have been fulfilled in every particular. All things have happened as they said. The Karens do not love each other, so they live apart in small communities. One sets himself above another, and no one will submit to the will of his neighbour; so they live in the forests, like the pheasant and jungle fowl, one in one place and another in another place. The white foreign teachers have come with our books, according to the words of the elders, that we may live in cities and villages again, and rise."

Karen is applied to several distinct tribes united by the common bond of having one language, though spoken in widely differing dialects. The Sgaus are the most numerous tribe, and occupy the widest extent of country. They are found from Mergui in Lat. 12° N. to Prome and Toungoo in nearly Lat. 19° N. On the east, they have wandered over the water-shed that separates the Meinam from the Salwen, and on the west, a few have passed into Arracan. The Burmese denominate them sometimes "Burman Karens," but they call themselves Sgau until passing the Southern boundary of Toungoo where they assume the name of Mau ne pgha, and on crossing Meet nan creek, that term is dropped for Paku. The Pwos call them Shan, but do not confound them with the tribes denominated Shans by the English. These they call Thaing. The Sgau may be distinguished by his tunic, which is white with a few red horizontal parallel stripes near the bottom. With a few rare exceptions none of the Sgaus are Buddhists.

The Pwos are found scattered in the same regions as the Sgaus to a short distance above Sitang. They are a more muscular tribe than the Sgaus, and have almost universally adopted Buddhism.

Tradition says they emigrated South from the Paku hills, and this tradition is confirmed by the fact that the Paku dialect is much nearer the Pwo than the ordinary Sgau. The Burmese call them Talaing Karens, the Sgaus Pwo, but their own distinctive name is Sho. Pwo, however, their Sgau name, has been introduced into English by the missionaries. Their tunics are distinguished from the Sgau by being handsomely embroidered near the bottom.

The Pwos are much less numerous than the Sgaus.

On crossing Thouk-ye-khat, or Draw-drink-water creek, an eastern tributary of the Sitang, which comes in about six miles

south of Toungoo, the country is found to be inhabited by Bghais. Their limits on the north are not exactly known, but they are bounded on the east by the banks of the Salwen. They are much greater savages than the other Karen tribes, and are robbers and kidnappers by profession. None are Buddhists, but all are worshippers of Indra and stones. There are stones in every house, to which in connection with Indra, buffaloes, hogs or fowls are sacrificed, and blood poured on them with prayers. Bghai is the name given them by the Sgaus or Pakus. They have no distinctive name for themselves, each clan calling itself by the name that designates man, precisely like אָדָם in Hebrew, which signifies both man in general, and Adam, *the* man. The Karens consider themselves as *the* men, for all the tribes have the habit of characterising themselves in the same way. They consist, however, of two or three sub-tribes, one of which, the most civilised, is distinguished by wearing tunics or frocks, while all the rest wear short pants scarcely reaching half down the thigh. The tunic wearers have had different names given them by the Burmans in different localities. Some are called *Liek-by ga gie,* or "great butterflies," and others *Liek-by ga gnay*, or "little butterflies." The pant wearers are divided by the Burmese into the *Yaing* or wild Karens who inhabit the mountains on the east and north, and the red Karens who dwell farther east in the valley of the Salwen. They seem to me, however, to be essentially the same people. The "wild Karens" have red radiating lines wrought in their white pants near the bottom, as the rays of the rising sun are sometimes represented ; and the red Karens are said to have their pants all red, or the red lines parallel; but all the red Karens I have met wore the Shan blue pants ; and some of those had the radiating lines tattooed on their backs which they exhibited as their coat of arms with considerable pride ; and indeed with one or two wild beasts from their forests, for supporters, it might be worked into a very respectable escutcheon.

The Sgaus, Pwos, and Bghais are the principal Karen tribes, but there are two or three smaller ones. The Mopghas occupy the secondary range of hills between Thouk-ya-khat and Kannie, red bank, creeks, whose mouths are about eleven miles apart, the latter falling into the Sitang five miles north of Toungoo. There are not

more than ten or twelve villages left of the whole tribe. They have some indistinct traditions of having been much larger formerly, but were reduced by wars. They skirt the Bghais on the west, and their dress cannot be distinguished from the tunic-wearers; nor have they any distinctive mark except their dialect. A few of the villages call themselves Mopgha, while others know no name for themselves but the word for man. The Burmans have different names for them, some being *Tau bya gie* or "great Bees," and others *Tau bya gnay* or "little Bees."

There is a small tribe that the Burmese call Tounggthus, from *toung* south or mountain, and *thu* person, signifying either southerners or mountaineers. They call themselves *Pa-au;* in some sections they are known only as pedlars, but in province Amherst and Pegu a few are settled in villages. The natives inform me that large numbers are settled on the north-west boundary of the Red Karens. They do not consider themselves Karens, but their language is nearly allied to that of the Pwo Karens, like them they are Buddhists, and they are a muscular tribe like the Pwos; but in dress they cannot be distinguished from the Shans. They claim Thatung, the old Talaing capital, as one of their ancient cities, and Bugdagautha, who first brought the Buddhist scriptures from Ceylon, as their countryman, but on no good grounds.

Quala, when among the red Karens, met with a tribe from the north who were called *Taru*, nearly the Karen pronunciation of Tarouk, the Burmese name for the Chinese. They shave the head leaving a tuft of hair on each temple. Besides their numerals, he noted down about twenty words, nearly all of which indicate a common origin with Karen. They are reported numerous north of the Red Karen country.

THE KAREN LANGUAGE.

The Karen language is distinguished from the Tai, the Talaing and the Burmese, the other independant tongues of farther India by possessing the Arabic sounds of غ ghain, ع ain, and خ kha, and by being nearly destitute of the initial gutteral imperfectly represented by *ng*, found in the other languages. It is remarkable, however, that these Arabic sounds are most common in Pwo and Sgau. In Bghai they are found in very few words, especially the first.

The Karen is remarkable for using words in pairs, in the signification of one of the two. Thus *nau* or *nang*, grass, takes for its couplet *mie* or *meing* wild [things] hence.

(1) *Klau* [weed,] *nau, klau mie*, weed the grass.
(2) *Klau nau mie*, „ „
(3) *Klau nau*, „ „

where the three forms have by usage the same signification, though literally they read,—

(1) Weed the grass, weed the wild [things.]
(2) „ „ the wild [things.]
(3) „ „

The couplet of *pho* child, is *lie* grand-child, and a story commences: "There was a man and his wife in former times, and they had no *pho* no *lie*," where *pho* alone would give the same signification.

An old man, before the fall, is represented as walking through the forest with his daughter behind him, whom he warns not to pluck the leaves from the trees. He says, "If you pluck the leaves and throw them down, they will become *kaseu*, they will become *kalo;* and when *kaseu kalo* come into existence, travelling will become very wearisome." Here *kaseu* is the significant word for mountain and *kalo* is the couplet.

Again he says, "If you throw down the leaves, they will become *paumu*, they will become *paulay*," where *paulay*, signifying sea or ocean, is the significant term.

The paired word is often chosen from some resemblance or association with the significant term, as:

Ta-u, takhie, cloud, darkness,	for	*ta-u* cloud.
Takhie, tana, darkness, night,	„	*takhie* darkness.
Die, nya, frog, fish;	„	*nya* fish.
Taphie, tanya, skin, flesh	„	*tanya* flesh.
Htwie, hto, dog, hog	„	*htwie* dog.
Hto, hsau, hog, fowl	„	*hto* hog.
Thama, payo, crocodile, dragon	„	*thama* crocodile.
Hteu, shie [Bghai] bird, fowl	„	*shie* fowl.
Me, htie boiled rice, water	„	*me* boiled rice.
Thwie, htie blood, water	„	*thwie* blood.

Khlie, tha seed, fruit ,, *tha* fruit.
Me-oo, phahsa fire, ashes ,, *me-oo* fire.
May, hau sand, earth ,, *may* sand.
Khoolau, bleulau, dig, immerse ,, *khoolau* dig.
Miemau, plauthau, dream, be in a reverie ,, *miemau* dream.
Ay, kwie love, covet ,, *ay* love.

Sometimes the couplet is a foreign word signifying the same thing, as

Klau, nwa, the bos genus, where *nwa* is Burman.
Htie, noung, water ,, *noung* is the Siam *nam.*
Heuphlong, heukhaung man ,, *khaung* ,, ,, *khon.*
Ta-u, tamyau, monkey ,, *myau* is Burman.
Mauhtau, para, pagoda ,, *para* ,,
Apo, àhau, to speak ,, *hau* ,,

Occasionally the secondary word appears to have been chosen for euphony, as

Phomu, phomeu, daughter, where *meu* has no signification.
Lie, lay, book ,, *lay* ,, ,,
Tamu, tala happiness ,, *la* ,,

Sometimes a couplet regarded as destitute of signification, proves, as our knowledge of the language extends, to be a significant word, thus :

Htsoo the couplet of *hsa* to be sick, was regarded as of no signification until the Bghai was acquired, where it signifies fever. So *la* the couplet of *ta-kapau,* or *hseuphang* light, is probably the Bghai *lie.*

This feature of the language suggests a probable etymology for many words; thus *le way* word, where *way* the non-significant term is probably of common origin with the Sanscrit वच्

The dialects exhibit some singular irregularities in the use of the personal pronouns. At Tavoy, *sá* or *seu* is the first personal pronoun, singular number in Sgau and is in much more common use than *ya* or *yeu,* which is also used ; but in Bghai it is the third personal pronoun, singular and plural, he, she, it, they ; and is used exclusively in some Sections, but a few villages near the Pakus use *wa.*

In Sgau and Bghai *nay* is the second personal pronoun singular, thou, thee; but in Mopgha it is the plural number of the same person, you.

In Pwo, *thie* is a particle marking the plural number of the second and third persons when affixed to the singular; but in Bghai it is an independant pronoun, the second person plural, you.

In Mopgha, the first personal pronoun singular *ya*, on being used as a possessive is changed to *ei*, pronounced precisely like the English I.

Objective forms for the third person, *au*, *eu*, and *sai* are peculiar to Karen as compared with the languages of other tribes.

The following table exhibits the pronouns in all their forms, in the various dialects.

	CaseAbsolute. I as to me.	*Nominative I,*	*Objective me*	*Poss. Pron. my.*
Sgau	Yá, or yay	Ya, yeu seu	Yá or yáy	As nominative.
Pwo	Yeu, or yawe	Ya, or yeu	Yeu	„ „
Bghai	Yay	Ya	Yay	„ „
Mopgha	Zá	Za	Zá	Ei
Toungthu		Khwa		

	Thou as to thee	*Thou*	*Thee*	*Thy*
Sgau	Ná, or nay	Na, or nen	Ná	As nominative
Pwo	Neu, or nawe	Na, or neu	Neu	„ „
Bghai	Nay	Na	Nay	„ „
Mopgha	Ná	Na	Ná	„ „
Toungthu	Ná	Na	Ná	

	As regards &c.	*He, she, it, they*	*Him, her, it, them*	*His, her, its, their.*
Sgau	Away	A, or way	Au	A.
Pwo	Awe	A, or we	Eu	A.
Bghai		So, or wa	Say	A, or Sa.
Mopgha		O, or wo		
Toungthu		Wa		

	Case Absolute. We, as regards us.	*Nominative We*	*Objective Us.*	*Poss. Pron. Our.*
Sgau	Pa way	Pa, or peu	Pgha	As, Nomin.
Pwo	Pa we	Pa, or Peu	Peu	„
Bghai	Kay	Ka	Kay	„
Mopghai	Kay	Ka	Wau	Oo, or Ei.
Toungthu		Ne		

	You, as regards you.	*You*	*You*	*Your.*
Sgau	Thu way	Thu	Thu	As, Nomin.
Pwo	Nathie	Nathie	Nathie	„
Bghai	Thie	Thie	Thie	„
Mopgha	Nay	Nay	Nay	„
Toungthu	Nathie	Nathie	Nathie	

The third person plural is the same as the singular.

Dialects.

The Sgau and Bghai have no final consonants, but Pwo, Mopgha, and Toungthu have them.

Sgau and Pwo. The most marked characteristic of Pwo is a final nasal *ng* where the roots in Sgau, and most of the other dialects have final vowels; as

Sgau,	*Te*	To form, create,	Pwo,	*Taing.*
„	*Nie*	Margin	„	*Naing*
„	*Hse*	A tunic	„	*Hsaing.*
„	*E*	To bite	„	*Aing.*
„	*Htau*	To ascend	„	*Htang.*
„	*Lau*	„ descend	„	*Lang.*
„	*Miemau*	„ dream	„	*Miemang.*
„	*Ghau*	An image	„	*Ghang.*
„	*Phau*	To cook	„	*Phang.*
„	*Khlau*	To heat	„	*Khlang.*
„	*So*	Power	„	*Saung.*
„	*Kho*	Land	„	*Khaung.*
„	*Thu*	The liver	„	*Thung.*
„	*Loo*	To follow	„	*Laung.*

Pwo often takes an aspirate where Sgau has a smooth mute, as

Sgau	*Ka*	To break	Pwo	*Kha.*
,,	*Ko*	To be hot	,,	*Kho.*
,,	*Ku*	,, eat	,,	*Khuk.*
,,	*So*	,, carry	,,	*Hso.*
,,	*Too*	,, receive	,,	*Htong.*
,,	*Plo*	The spine	,,	*Phlo.*
,,	*Pla*	To dismiss	,,	*Phla.*

A middle or flat mute in Sgau, often becomes a rough or smooth mute in Pwo, as.

Sgau,	*Die*	The cucumber,	Pwo,	*Htie.*
,,	*Ble*	To be smooth	,,	*Phle.*
,,	*Bghie*	To rest	,,	*Pwie.*
,,	*Dway*	The grasshopper	,,	*Htway.*
,,	*De*	A branch	,,	*Htaing.*

Occasionally it is the reverse, as :

Sgau,	*Tau*	To strike	Pwo	*Do.*
,,	*Htie*	To see	,,	*Da.*

A formative smooth mute in Sgau is often wanting in Pwo, as :

Sgau,	*Kana*	To listen	Pwo	*Na.*
,,	*Kale*	The kidneys	,,	*Le*
,,	*Kaman*	,, spleen	,,	*Mang.*
,,	*Kamu*	Dust	,,	*Mu.*
,,	*Kateu*	End	,,	*Htu.*
,,	*Kapie*	Mud	,,	*Phie.*
,,	*Mukanau*	A maiden	,,	*Munang.*
,,	*Sakho*	The mango	,,	*Kho*
,,	*Thapeu*	A chatty	,,	*Phung.*
,,	*Thadie*	The gall bladder	,,	*Die*

The Sgau *ny* is not found in Pwo, Y usually supplying its place ; as

Sgau,	*Nya*	Before	Pwo	*Ya.*
,,	*Nyau*	To be easy	,,	*Yau.*
,,	*Kanyau*	To refuse	,,	*Kayang.*
,,	*Thakanyau*	Mercy	,,	*Yangtha.*

The letter *H* in Sgau often becomes gh in Pwo, as :

Sgau	*Ha*	To walk	Pwo,	*Gha.*
„	*Hà*	Evening	„	*Ghà.*
„	*Han*	To weep	„	*Ghang.*
„	*Hu*	„ steal	„	*Ghu.*
„	*He*	„ hate	„	*Ghain.*

Bghai. While Bghai coincides with Sgau in all its words ending in vowels it differs from it, as well as the Pwo, in introducing a large number of new words, as :

Bghai	*Die*	Year	Sgau	*Nie.*
„	*Hooklaypoo*	Field	„	*Khu.*
„	*Khauklay*	Door	„	*Tray.*
„	*We*	Margin	„	*Nie.*
„	*Awayway*	Another	„	*Agha.*
„	*Way*	An insect	„	*Kha.*
„	*Nay*	Self	„	*Tha.*
„	*So*	A slave	„	*Ku.*
„	*Tapheu*	Fish	„	*Nya.*
„	*Twie*	A net	„	*Pgha.*
„	*Datheu*	A basket	„	*Ku.*
„	*De*	Boiled rice	„	*Me.*
„	*Peu*	A large fish net	„	*Sa.*
„	*Tayyautayya*	An image	„	*Taghautaphau*
„	*Mahtau*	A pagoda	„	*Kho.*
„	*Lookheu*	A grave	„	*Thwakho.*
„	*Klie*	Soldier	„	*Thu.*
„	*Kiekay*	Evil	„	*Eu.*
„	*Khauway*	Sin	„	*Tadayba.*
„	*Khauwayma*	Hell	„	*Lara.*
„	*Lie*	Light	„	*Kapau.*
„	*Kway*	To pour	„	*Gha.*
„	*Khoo*	To be bold	„	*Doo.*
„	*Khau*	To be wide	„	*Lay.*
„	*Khyie*	To appoint	„	*Thepa.*
„	*Wie*	„ fly	„	*Yoo.*
„	*Weu*	„ bark	„	*Mau.*
„	*Wephlau*	„ throw away	„	*Kwiete.*

Bghai	*We*	To wither	Sgau	*Khe.*
"	*Suba*	" wash,	"	*Thesau.*
"	*Sa*	" look	"	*Kwa.*
"	*Eumiesa*	" think	"	*Hsokamo.*
"	*Seu*	" be cool	"	*Khu.*
"	*Sway*	" run	"	*Khe.*
"	*Chu*	" perspire	"	*Kapeu.*
"	*Shieshay*	" fear	"	*Phlie.*
"	*Oosha*	" bathe	"	*Ln.*
"	*Shie*	" meet	"	*Thagheu.*
"	*Shuy*	" be warm	"	*Khlau.*
"	*Shaumieta*	" forget	"	*Thapienau.*
"	*Zay*	" heal	"	*Bla.*
"	*Dje*	" laugh	"	*Nie.*
"	*Taplau*	" ride	"	*Do.*
"	*Taie*	" testify	"	*U.*
"	*Ata*	" ask	"	*Khe.*
"	*Na*	" be straight	"	*Lo.*
"	*Htie*	" throw a net	"	*Hu.*
"	*Hteu*	" be heavy	"	*Kheu.*
"	*Pa*	" " difficult	"	*Khau.*
"	*Hto*	" anoint	"	*Phghoo.*
"	*Deubayyaba*	" reverence	"	*Yooyau.*
"	*Na*	" have capacity	"	*Trau.*
"	*Pgha*	" found	"	*Thoo.*
"	*Shauie*	" watch	"	*Kho.*
"	*Hau*	" reprove	"	*Doo.*
"	*Khoo*	" be fierce	"	*Doo.*
"	*Botha*	White	"	*Wa.*
"	*Aychayna*	Well	"	*Kasaudau.*
"	*Shotabla*	Around	"	*Watarie.*
"	*Na*	Causative particle	"	*Meu.*
"	*Ba*	Affix of perfect tense	"	*Lie* [Pwo *youk*

There are many other words in common use differing as much as the above.

It is remarkable that *yuwà*, the name for the god who created the heavens and the earth and all things, is known to a part of the Bghais only; and those use it with a prefixed *ta*, and always with the adjective *deu* great affixed, making it *tayuwàdeu.* The pant wearing Bghais on the north tell me they use *Khwekhwà deu* for the same being; and a couple of young men who recently visited the Bghais near our north east frontier, report *Teu mau* as used for *yuwà.* Quala says that the greatest difficulty he found in addressing the Bghais in his journey to the Red Karens was his inability to discover the name they gave to *yuwà.* The name for Satan is subject to like variations. In Sgau it is *Mukaulie*, in Pwo, *Mukaulaing*, and the name I have adopted in Bghai, as being best known to those who will read the books, is *Htoo way khay*, but there are several other names, as *Modielie* the same word by which they designate the gecko, and *Mopraymu.* Adam whom the Sgaus call *Thanay*, some of the Bghais call *Ayrabay;* and the Sgau *ie-u* for Eve they change to *Mora.*

The Bghai is remarkable for hissing dentals. The people speak with their teeth closed when pronouncing many words, and but slightly apart when uttering others. *Hs*, very common in Sgau and Pwo, has no place in the dialect, being changed to *sh.* The Bghai has several consonant sounds as *g*, *j*, *z*, and a peculiar hissing *dj* that cannot be adequately represented by English letters, which are not found in the southern dialects.

The Sgau *gh* often becomes *wa* in Bghai, as:

Bghai	*Wie*	To enumerate	„	*Ghie.*
„	*Woo*	A serpent	„	*Ghu.*
„	*Awoo*	Use force	„	*Ghoo hsoo.*
*„	*We*	Gash, cut	„	*Ghay.*
„	*We*	Concerning	„	*Ghe.*
„	*We*	Ratan	„	*Ghe.*
„	*We*	Good	„	*Ghe.*
„	*Way*	To rise	„	*Geay.*
„	*Wau*	Cold	„	*Gho.*

* These words, though alike here, are distinguished by intonation in the printed Karen.

While the Pwo adds to the aspirates in Sgau, the Bghai sometimes takes a flat mute where there is an aspirate in Sgau, as:

Bghai	*Kookeu*	Head,	Sgau,	*Kho.*
,,	*Kà*	Behind	,,	*Khie.*
,,	*Kauthoo*	Secret	,,	*Khoothoo.*
,,	*Kau*	Future	,,	*Khay.*

The Pwo prefix *ang* to some active verbs, and which has ordinarily no representative in Sgau, becomes *à* in Bghai, as:

Bghai	*Á shay*	To sell	Pwo,	*Anghsa.*
,,	*Á she*	To beat in a mortar	,,	*Anghsoo.*
,,	*Á woo*	,, take by force	,,	*Angghook.*
,,	*Á thateu*	,, send	,,	*Angmeung.*
,,	*Á hoo*	,, steal	,,	*Angwoo.*
,,	*Á lo*	,, borrow	,,	*Anglaung.*
,,	*Á pha*	,, cook	,,	*Angphaung.*

The Sgau vowel *au* often becomes *à* in Bghai, as:

Bghai	*La*	To descend	Sgau,	*Lau.*
,,	*Hta*	,, ascend	,,	*Htau.*
,,	*Kha*	Foot or leg	,,	*Khau.*
*,,	*Da*	To chop	,,	*Dau.*
,,	*Da*	To be shallow	,,	*Dau.*
,,	*Na*	Area	,,	*Nau.*
,,	*Lapgha*	Fall in ruins	,,	*Laupghau.*
,,	*Lasha*	To be different	,,	*Lauhsau.*
,,	*Khà*	Only	,,	*Khau.*

The Sgau vowel *à* is often *ay* in Bghai, as:

Bghai,	*Khay*	To step	Sgau	*Khà.*
,,	*Pay*	Side	,,	*Pà.*
,,	*Say*	To be weak	,,	*Sà.*
,,	*Bay*	To hit	,,	*Bà.*
,,	*Nay*	Night	,,	*Nà.*
,,	*Ay*	Many	,,	*Á.*
,,	*Play*	A cubit	,,	*Plà.*
,,	*May*	To make	,,	*Mà.*

* Distinguished by intonation.

The vowel *eu* is a favorite in Bghai. It takes the place of several Sgau vowels, as :

Bghai	*Theu*	A tree	Sgau	*The.*
,,	*Meu*	The sun	,,	*Mu.*
,,	*Meu*	The eye	,,	*May.*
,,	*Seu*	A corpse	,,	*So.*
,,	*Hteu*	High	,,	*Htau.*

The most remarkable distinction is found in the numerals. The names for the first five are almost identical with the Sgau, but :

Six	is	*theu*	*tho*	literally	Three-two.
Seven	,,	,,	,, *ta*	,,	Three-two-one.
Eight	,,	*lwie*	*tho*	,,	Four-two.
Nine		,,	,, *ta*	,,	Four-two-one.

The language of the Mikirs in Arracan, has something similar; there

Seven	is	*thor-chie*	literally	Six	one
Eight	,,	*nu-kep*	,,	Two	ten i. e. 10—2
Nine	,,	*chi-kep*	,,	One	ten i. e. 10—1

There is nothing parallel in any of the languages or dialects spoken around.

There are a multitude of sub-dialects in the Bghai, every village boasting of possessing some peculiarity in its language. In one the letter *tha* is unknown, *ta* being always used in its place; and in one day's walk I have found the common word for speak to be changed from *apo* in the morning, to *hie* at noon, and then back towards the Sgau to *katau* at eve.

Mopgha. The Mopgha introduces several new letters into Karen, some of which, if not all, are found in Shan.

It has a peculiarly strong *f*, uttered with a forcible emission of the breath; as

Mopgha	*Feu*	A child, or son,	Pwo	*Pho.*
,,	*Feu*	To fly	,,	*Youk.*
,,	*Fu*	A bird	,,	*Hto.*
,,	*Fo*	Head	,,	*Kho.*

It has both an initial and final *v* passing into *f* in one of the sub-dialects ; as :

Mopgha	*Vuv*	To offer	Pwo	*Boung.*
,,	*Veu*	,, make an end	,,	*Louk.*
,,	*Vedz*	,, guide	,,	*Thoung.*

There is a final *dz* in Mopgha, not found in the other dialects, as ;

Mopgha	*Pudz*	To instruct	Pwo	*Thoung.*
,,	*Hsiedz*	,, seize	,,	*Phie.*
,,	*Lapodz*,	the spider	,,	*Khan.*

Several words which are formed of *m* followed by a vowel in the other dialects, have the same consonant preceded by a vowel in Mopgha, as :

Mopgha	Pwo	Sgau	Bghai	
Am	*Mo*	*Mo*	*Meu*	Mother.
Em	*Meing*	*Mie*	*Mie*	Name.
Um	*Muk*	*Mu*	*Mau*	Happy.
Lem	*Mung*	*Thamu*	*Thamo*	Live.

When these words are preceded by another word with an inherent vowel, the inherent vowel is dropped and the consonant is united with the vowel of the root, as :

Za	my, and	*am*	mother, become	*Eim*	my mother.
Na	thy, ,,	,,	,, ,,	*Nam*	thy ,,
Na	thy, ,,	*umpo*	musket ,,	*Numpo*	thy musket.

When the first word is followed by a distinct vowel, the initial vowel of the second word is dropped ; as :

Kay	our, and	*am*	mother, become	*Kaim*	our mother.
Nai	your, ,,	,,	,, ,,	*Naim*	your ,,

Words with a final *v* are subject to the same rules, as :

Latu	a city	*av*	in, become	*Latuv*,	in the city.
Panay	buffalo	,,	,, ,,	*Panaiv*	in a buffalo.

The Mopgha has a peculiar hissing sibilant which seems to take the place of *hs* in the other dialects ; *th* is wanting, being changed to *t ;* and *z* takes the place of *y*. Altogether it is the most peculiar of the Karen dialects, and yet is spoken by not more than two thousand people, who speak it in two or more well marked sub-dialects.

Toungthu. The Toungthu, or Pa-au dialect has a *v* not found in Sgau or Pwo, but with this exception, it is nearly related to the Pwo with an occasional deviation towards the Bghai. No attention however has been given to the dialect, beyond the collection of a small vocabulary of words that I made half a dozen years ago, and which was published, with some typographical errors, by Mr. Hodgson in the Journal of the Asiatic Society of Bengal, No. 1, 1853, under the name of Toungthoo and credited to Dr. Moreton. It will be found corrected in my vocabulary of the dialects at the close of this paper.

Taru. All known of this dialect is the few words collected by Quala, and given below, except the numerals which will be found in the vocabulary. The numerals show the nearest affinity to the Pwo, and are most remote from the Bghai.

Taru	*Moo,*	Heaven	Sgau	*Mookho.*
,,	*Haloo,*	Earth	,,	*Haukhoo.*
,,	*Pamo*	Woman, female	,,	*Pomu.*
,,	*Pakho*	Man, male	,,	*Pokhwa.*
,,	*Takho*	Child	,,	*Phothakhwa.*
,,	*Tieta*	Salt	Bghai	*Ie-ta.*
,,	*Kle*	A road	Sgau	*Klay.*
,,	*La*	Leaf	,,	*La.*
,,	*Ta*	Fruit	Bghai	*Ta.*
,,	*Poola*	Betel leaf	Pwo	*Phula.*
		,,	Bghai	*Thapoolay.*
,,	*Mamoote*	Areca nut	,,	*Mamoota.*
,,	*Gnwa*	The mouth	Pwo	*No.*
,,	*Lakan*	The nose	Bghai	*Naykhede.*
,,	Say	Boiled rice	Sgau	*Me.*
,,	*Zoo*	A house	Bghai	*He.**
,,	*Te*	To return	Pwo	*Taing.*
,,	*Hswa*	,, come	Bghai	*Sway* to run.
,,	*Phoo*	Good	,,	*We-bay.*

* In some of the Bghai sub-dialects the *h* is pronounced as if passing into *z*.

The Vocabulary.

The following vocabulary contains the words which have been selected by Indian philologists to develope the affinities and differences of languages. In the Journal of the Asiatic Society of Bengal, and in the Journal of the Indian Archipelago, Hodgson, Logan and others have published the same words in all the known languages from Australia to Siberia, and from the Yellow Sea to the Black. With these the Karen may now be compared in all its known dialects. The couplets have been added occasionally, but to have inserted them in every instance would have subserved no useful purpose.

English	*Sgau*	*Pwo*	*Bghai*
Air	Kalie	Lie	Kalie.
„ coup.	Thanghau	Lang	Waythra.
And	Dau	Day	Lay.
Ant	Teu	Htung	Teu.
Animal	Taphotaḳha	Hseuphohseukha	Taypheutayway.
Arrow	Pla	Phla	Play.
Bad	Eu	Eung	Kiekay.
„ coup,	Thau	Thaung	Meulay.
Beautiful	Aḳhieala	Aḳhieala	Apeubayaghawe.
Bee	Kanay	Ne	Kane.
Believe	Na	Nay	Nay.
„ coup.	Soo	Soo	Zoo.
Belly	Heupheu	Ghoophoug	Kaphoo.
„ coup.	Heukho	Thaphong	Thaphoo.
Bird	Hto	Hto	Htubapheu.
„ coup.	Lie	Lie	Htubashay.
Bitter	Kha	Kha	Khay.
Black	Thoo	Theung	Lay, or thieche.
Blood	Thwie	Thwie	Thwie.
Boat	Khlie	Khlie	Khlie.
„ coup.	Hto	Htaung	Kapay.
Bone	Khie	Khwie	Khwie.
Book	Lie	Liek	Sai.
Bow			
Boy	Phothakhwa	Phothakhwa	Pheuthaykheu.
Brass	Tobau	Htoungbang	Kreba.
Bring	Has no independant root, but is made from two signifying literally *come-carry*.		
Broad	Lay	Lay	Khau.
Buffalo	Pana	Pana	Panay.
Burn	There are several specific words for this generic one.		
By. Ins.	Leu	Leu	Lay.

Mopgha	*Toungthu*	*Remarks*
Lalie	Talie	Siam, *Lon.*
		Koreng, *Tinghuu.*
Lay	La	Bur. *lay* Talaing *la.*
Hten	Htung	
Tafeutakha		
Pla	Pla	Koome, *pala* Shan, *pen.*
En	Kay	Compare Greek κ α κ ὶ α,
To		
Akheaghaughe tara		
Lane		
Nam		
Num		
Pan		
Teubo	Awa	Limbu, *bu.*
Teuba		
Kha	Kha	Bur. *kha* Shan *khou.*
Tuk	Phren	Shan *lau.*
Sweit	Thwe	Tibetan *thak.*
Hlick	Phre	Bur. *hlay.*
		This couplet signifies by itself *a raft.*
Hteu		
Khie	Hsot	Shan *sot* Chin. *kuh, a kweh.*
Sa	Sa	Bur. *sa,* Talaing, *leik.* Chin. *shoo.*
		Bow differs from boat in the intonation only.
Feuta		
Teugwa	Toung	Brass and copper are made from the same generic root with the adjective yellow and red affixed.
Lay		
Lana	Pana	

Which one could be compared legitimately with the other vocabularies is impossible to conjecture.

Lay

English	*Sgau*	*Pwo*	*Bghai*
Call	Ko	Ko	Yeu.
,, coup.	Yu		
Cat	Thamieyau	Meinyau	Mieyankau.
Cheek	Bo	Nopahtie	Bau.
Child	Photha	Photha	Piesaypeu.
Chin	Kha	Kha	Khay.
Cloud	Taeu	Hseueung	Tayeu.
Cold	Gho	Ghaung	Wau.
Come	Hay	Ghay	Le, or ge.
Country	Kau	Khang	Ka.
Copper	Toghau	Htoungwau	Krieba.
Cow	Klau, or po	Khlau	Peu.
Crooked	Ke	Kaing	Ke.
Crow	Sauwakha	Kla	Sowa.
Dark	Khie	Khie	Khie.
Daughter	Phomu	Phomu	Pheumu.
Day	Nie	Nie	Nie.
,, coup.	Thau	Thoung	Thay.
Deaf	Nataeu	Naeung	Naykootaeu.
Deer (samber)	Takhau	Hseukhau	Kheu.
Demon	Tana	Hseuna	Taynay.
,, coup.	Tawie	Hseupho	Taykaphoo.
Die	Thie	Thie	Thie.
Dig	Khoo	Khung	Khoo.
Dog	Htwie	Htwie	Htwie.

	Mopgha	*Toungthu*	*Remarks*
	Zeu	Tom	Chin. *yerieh.*
	Miezau	Nyoo	Chin. *miau.*
	Bo		
	Feu		
	Kha		Sans. चिवि *chivi.*
	Taeu		The *ta, hseu, tay* prefixed to this and many other roots is the same formative particle.
	Ghau	Khwa	Shan. *kat.*
	Hay	Lon	Chin. *lay* and *kwoh.* The Bghai has no distinct word for come, but uses *le* go, or *ge* return, for it.
	Kho		
	Kriebo	Htoung	
	Peu	Phou	Comp. *klau* with गो ; *peu* with *bos.* Tibetan *ba.*
Crooked	kay	Nga keu	
Crow	Sagwa	Zanká	
	Khie		
	Feu meu		
	Ne	Ya	Bur. *ne* Bur. *yet,* embraces both the night and day.
	To		This couplet designates the Bur. *yet.*
	Nalaeu		
	Hseu		
	Tana		
	Tapoo		
	Tei	The	Chin. *se.*
	Khau		Sans. खन.
	Htwie	Htwie	Mru. *takwie.*

English	*Sgau*	*Pwo*	*Bghai.*
Drink	Au	Au	Au.
Duck	Htode	Htohta	Oopayde.
Ear	Na	Na	Naykoo.
„ coup.	Nu	Noug	Naykau.
Earth	Haukho	Ghangkho	Lakheu.
East	Muhtau	Muhtaung	Muhta.
Eat	Au	Ang	A
Egg	Die	Die	Die
Elephant	Kahsau	Kahsaung	Kasha
Eye	May	Me	Meuladoo.
End, consume	Leu	Louk	Leu.
Enter	Nu	Nu	Nu.
Fat	Bau	Baung	Bau.
Father	Pa	Pha	Pa, or ta.
Flat	Beba	Papay	Bieba.
Fever	Nyagho	Hsooghouk	Shwie, or shoo.
Few	Sgha	Sha	Shie.
Fight	Du	Du	Du.
Fire	Meoo	Meeung	Me.
Fish	Nya	Ya	Tapeu.
Finish	Wie	Ghoung	Wa.
Form, make	Te	Taing	Bau.
Flower	Phau	Phan	Phau.
Fly	Yu	Yoo	Wie.
Foot	Khau	Khang	Kha.
Forest	Pgalakla	Meinglakla	Sapoklay.
Frog	De	De	De.
From	Leu	Leu	Leu.
Give	He	Pe	Ie.
Go	Lay	Le	Le.

	Mopgha.	*Toungthu.*	*Remarks.*
	Oo	Awa	
	Haupay		
Ear	Na	Na	Singpho *na.*
	Nu		
Earth	Hau feu,	Hamtan	
	Meuhto		Lit. *sun-ascend.*
	Au	Am	The Sgau *eat* and *drink*, are distinguished by inonation.
	Dei	Die	Mru. *dui.*
	Lahso	Hsan	Shan. tsang. Chin. *siang.*
	May	May	Shan. *matta*, Chin. *moh.*
	Veu		
	Lieum		
	Bay	Bay	
	Pa	Pha	
	Bayba	Sampya	
	Shwie		
	Sha		
	Du		
	Meouk	Me	Botia. *me.*
	Za	Hta	Shan. *pa* Chin. *yu.*
	Wa		Chin. *wan.*
	Bu		Chin. *tuon.*
	Foo	Heu	Limb. *phu.*
Fly	Fu		Chin. *fei.*
	Khau	Khan	Tibetan. *kang.* Foot and leg are made from the same root.
	Khuklavu		
	Dei		
	Leu		
Give	He	Pha	Shan. *pan.* Bur. *pay.*
	Le	Lway	Sunawar. *lau.*

English.	*Sgau*	*Pwo*	*Bghai*
Girl	Pothapomu	Phothamu	Piesaypheupheu-mu.
Goat	Maytaylay	Be	Paykolay.
God	Yuwa	Yuwa	Tayuwa.
Gold	Htoo	Htaung	Htway.
Good	Ghe	Ghe	We.
Guide	Sgheu	Thoung	Thay.
Great	Do	Do	Deu.
Hair	Khothoo	Khothoo	Kheuloo.
Hand	Su	Su	Su.
Happy	Mu	Mu	Mau.
Hard	Ko	Naung	Ma or ko.
Head	Kho	Kho	Kookeu.
Hear	Nahoo	Nagheung	Shaunay.
Heart	Tha	Tha	Tha.
Heaven	Mookhoo	Mookhoo	Maukheu.
Hell	Lara	Lara	Khauwayma.
Here	Phayie	Htaungyo	Dauyeu.
High	Htau	Htau	Hteu.
Hog	Hto	Hto	Htau.
Horn	Neu	Nong	Neu.
Horse	Kathe	Kathe	Thie.
Hot	Ko	Kho	Keu.
House	Hie	Ghaing	He.
Hunger	Tathawie	Hseuthawie	Taythawie.
Husband	Wa	Wa	Wa.
In	Leupoo	Leupeung	Leupoo.
Iron	Hta	Hta	Htala.
Ivory	Kahsaumay	Kahsaungmay	Kashathro.
Kill	Mathie	Mathie	Maythie.
King	Saupa	Sakhwa	Shaparga.
„ coup.	Saulo	Salong	Shadeu.

	Mopgha	*Toungthu*	
	Feumeu		
	Piekoolay	Bay	Shan. *pa.*
	Layuwa		
	Teu	Khan	Chin. *kin,* and *kum.*
	Ghe	Heu	
	Vudz		
Great	Deu, and vu	Tan	Chin. *ta.* Tai *di.*
	Feuhtook	Taloo	
	Sook	Su	Chin. *syu.* Hand and arm are made from the same root.
	Um		
	Ma	Ma	Bur. *ma.*
	Feu, or kho	Katu	Bur. *khoung.* Shan *ho.*
	Nahoo	Heun	
Heart	Ta		
	Maufeu		
	Lara	Lara	Sans नर.
	Phayie		
	Hto	Hto	
	Htook	Htau	Chin. *tehee.*
	Nau	Nung	
	Lagho	Tha	Botia *ta.* Aka. *ghura.*
	Ko	Kheu	
House	Heik	Lam	Shan. *hien.*
	Tawaime	Hookho	
	Wa		
	Leupo	Poo	The *leu* precedes the noun, while *poo* is affixed.
	Htala	Pathie	
	Lahsome		Literally, *elephant-tooth.*
Kill	Mateik	Mathie	Literally *make-death.*
	Sobaro		Bur. *shenbuyen.*

English.	*Sgau*	*Pwo*	*Bghai*
Kiss	Neumoo	Neungmeung	Numau.
Laugh	Nie	Nie	Dje.
Law, (moral)	Tatho	Hseuthaung	Tadauoo.
coup.	Tathau	Hseuthang	Shauoo.
„ civil	Kwau	Khaung	Beu.
coup.	Beu	Htwe	Kwa.
Lead	Pgha	Sha	Pa.
Leaf	La	La	Lay.
Leg			
Little	Hsie	Pe	Shie.
Live	Moo	Meung	Thamo.
Lift up	Sauhtau	Hsahtang	Sahta.
Light	Kapau	Phang	Lie.
Lightning	Lauwaadie	Langwaadie	Lawanadie.
Lord	Kasa	Kahsa	Biesay
Loom	Hta	Hta	Hta.
Long	Htau	Htau	Hta.
„ distant	Yie	Yaing	Djie.
„ in time	Yie	Yie	Djie.
Man	Pghaknyau	Heuphlong	Pieya.
„ coup.	Pghathapleu	Heukhong	Pieyeu.
Medicine	Kethie	Thie	Thaukhwie.
Milk	Nuhtie	Mhte	Nuhtie.
Moon	La	La	Lay.
Morning	Mughau	Mughau	Muhau.
Mother	Mo	Mo	Meu.
Mountain	Kaseu	Kholaung	Khaumu.
„ coup.	Kalo	Htounglo	Hhaulau.
Mouth	Htakho	No	Lamau.
Musquito	Paso	Paso	Paso.
Name	Mie	Meing	Mie.
„ coup.	Tha	Tha	Thay.

	Mopgha	*Toungthu*	*Remarks*
	Neumuk		Literally *smell-happy*.
	Ne	Nga	Murmi *nya*.
	Tato		
	Tatau		
	Beu		
	Sheu		
	Pgha	Soon	
	La	La	
			See foot. Chin. *kiah*.
	Hseik		
	Moo, and liem		
	Sotau	Hya	Literally *carry-ascending*.
	Talapo	Htala	Bur. *len*. Shan *len*.
	Lauwaadie		Lit. *the thunder flaps his wings*.
	Lasa		
	Hta		
	Htoo	Hto	
	Tzes		Chin. *yuen*.
	Tzes		Distinguished in intonation.
	Zezau, or plau	Lau*	Bur. *loo*. Shan *khoung*.
	Kathie	Lateik	
	Nuhteik		Literally *breast-water*.
Moon	La	La	Shan *leu*.
	Meuwoo		
	Am	Meu	Shan *amya*.
	Laseu	Koung	Chin. *khou*, and *hau*.
	Lalau		Simanes *khamta*.
Mouth	Htafeu	Proung	
	Laseu	Takhia	
	Em, or meik	Meing	Bhotia and Chin. *ming*.

* Read Peido, zezau, or Plau.

English	*Sgau*	*Pwo*	*Bghai*
Neck	Ko	Kho	Gau.
New	Thau	Thang	Thay.
Night	Na	Na	Nay.
„ eve	Ha	Gha	Hay.
No	Tameba	May-e, or mway-e	Tamenau, or nau. or tamepato.
Noon	Moohtoo	Muhtang	Moohtiehta.
North	Kalieso	Liekhie	Kalieakhiesau.
„	Mukapa	Moopa	Mookapay.
„	Hsakahsau	Shakahsang	Shaykasha.
Nose	Nade	Na	Naykhede.
Of	A	A	A.
Oil	Tho	Tho	Theu.
Old (of things)	Laulie	Lauglie	Liela.
„ (of persons)	Pgha	Sha	Pghay.
Paper	Sakho	Sakhou	Saykoo.
Plantain	Thakwie	Thakwie	Ya.
„ wild	Ya	Ya	
Poison	Su	Su	
Rain	Tahaysu	Hseuhseung	Waylesu.
Rat	Yu	Yu	Yu.
Raw	Thiekasay	Theinghse	Thietheu.
Red	Ghau	Wau	Liekau.
Rice (paddy)	Boo	Boo	Boo.
„ (cleaned)	Hu	Woo, or ghoo	Hoo.
„ (boiled)	Me	Me	De.
Return	Ke	Htaing	Ge.
Ripe	Me	Meing	Mie.
River	Lo, klo	Lo	Lau.
Run	Sie	Saingtalaing	Sway.
Road	Klay	Pungtha	Klaypootha.
„ coup.	Kapoo	Pungthung	

	Mopgha	*Toungthu*	*Remarks.*
	Khau		
	Tauk		
	Na		
	Ha	Ha	
	Me-e or me-khay	Tamwateu	
	Meuhtook		
	Lalieso		Literally *wind-top*.
	Meupa		,, *sun-side* applied also to south.
			,, *elephant-star* i. e. ursa major.
	Nade		
	A	A	
	Nayteu	Namau	
	Leik		
	Pgha		
	Sokeu		Bur. *sekkoo.*
Plantain	lakwie	Gna	Shan. *hwa.*
	Za		
	Khayhaysu		
	Zu		
	Siateu	Tathiet	
	Wook	Tanya	Shan. *leu.*
Rice	Beu		
	Huk		
	May		
Return	Ga		
	Meik	Hm a	Bur. *hme.*
	Loo		
	Sie	Lau	Chin. *tsou.*
	Peuta	Klaytan	

English	*Sgau*	*Pwo*	*Bghai*
Round	Phleuthaleu	Talookoo	Phleu to hie.
Salt (noun)	Ietha	Htiela	Iethay, or ieta.
„ (verb)	Hau	Ghang	Hay.
Sand	May	Me	Thame.
Sea	Paulay	Panglay	Palay.
Separate	Pha	Pha	Pha.
Shame	Mayhsgha	Memay	Meuthawa.
Ship	Kabau	Kabang	Thaypau.
Short	Phu	Pie	Pheu.
Sick	Hsa	Hsa	Shay.
Side	Kapa	Ghupha	Kapay.
Silent	Bghau	Langmang	Sau.
Silk	Thato	Hto	Thaie.
Silver	Se	Se	Ho.
Sister	Daupuwaymu	Htungphuwemu	Thaypuwaymu.
Sit down	Hsenau	Hsenang	Shana.
Skin	Phie	Phie	Phe.
Sleep	Mie	Mie	Shaumie.
Slow	Kayaukayau	Kyaukyau	Khaykhay.
Small	Hsie	Pe	Shie.
Smell	Neu	Neung	Nu.
Snake	Ghu	Ghoo	Woo.
Soft	Kapooloo	Phook	Kapeutaloo.
Son	Phokhwa	Phokhwa	Pheukheu.
Soul	Tha	Tha	Tha.
Sound	Thau	Thau	Thay.
Sour	Hsei	Hsaing	She.
Spirit	Kala	La	Kalay.
South	Kaliehtie	Liehtie	Kalieakhahtie.
„	Maylaka	Hsanrung	
Speak	Kato, and po	Khlaing	Apo, & hie, & yie.
Say	Sie, and tay	Lau	Dau.
Stand up	Hseuhteu	Hseunhtung	Shauhteu.
Star	Hsa	Sha	Shay.

	Mopgha	*Toungthu*	*Remarks.*
	Htophlau	Tunglung	Bur. *lung.*
	Deikta	Tatha	
	Hau		
	Me		
	Pole		Bur. *penlay.*
	Pa		Chin. *peen.*
	Maykya		
	Thaybo		Bur. *thembau.* Tal. *kabang.*
	Pheu	Pu	
	Hsa		Chin. *Syao.*
	Lapa		
	Sau	Nging	
	Lapfu&lahteu		
	Seu, & theik	Rou	Hindi *sid* Tal. *sraun.*
	Htauphau-waymu		
Sit down	Hsaunau	Unglau	
	Pahie	Phro	Chin. *pi.*
	Meik	Ping	
	Khaykhay		
	Hseik	Pa	Chin. *Syao.*
	Neu		
	Ghuk	Hru	
	Bok		
	Feuhwa		
	Ta		Literally the *heart.*
	Lalouk		
Sour	Shie	Hsya	Shan. *htsoi.*
	Lale		Chin. *ling.*
			Literally *foot of the wind.*
			,, constellation of *the cross.*
	Po	Ungdau	
	Tay		Shan. *sat, lat.*
	Sheuhteu	Unghtung	
	Hsa	Hsa	Chin. *sing.*

Y 2

English	*Sgau*	*Pwo*	*Bghai*
Straight	Lo	Loung	Na.
Strike	Tau	Do	Peu.
Stone	Leu	Long	Leu.
Sugar	Iethahseu	Htielahseung	Iethayshie.
Sun	Mu	Mu	Mu.
Sweet	Hseu	Hseung	Shie.
Swift	Khle	Khliang	Pgha.
Sword	Na	Na	Dashe.
Tell	Sieba	Lauba	Daubay.
Tail	May	Me	Kame.
Take, seize	Hiene	Phoungpie	Piene.
„ coup.	Piekha		Piese.
„ away	Keso	Tainghso	Gesa.
That	Ane	Aynau	Anu.
This	Aie	Ayyo	Ayeu.
Thunder	Lauthau	Lanthay	Lathay.
Tiger	Khe, and botha-o	Khe	Khe,& taypoolie.
Tin	Pgha	Sha	Pabotha.
To	Hsoo	Leu	Seu.
Tobacco	Kathie & nya thoo	Kathie, & yathoo	Kathie.
To-morrow	Khayghau	Kayghai	Kaumoohau.
Tongue	Ple	Phle	Ple.
Tooth	Mai	May	Theumay.
Tree	The	Theing	Theu.
Ugly	Aghaueu	Aghaugeung	Akheu aghaukie-kay.
Understand	Napeu	Nathe	Naykoonu.
Unto	Tu, and hsoo	Htung, leu	Ta, tu, seu.
Wake	Phuthenau	Nangatha	Phuthenay.
Walk	Ha	Gha, & saing	Hay.
Wash	Thesau	Thieyahseing	Suba.
Water	Htie	Htie	Htie, and shu.
„ coup.	No	Noung	

	Mopgha	*Toungthu*	*Remarks.*
	Lo	Son	
	Peu	Tway	Shan. *pautihn* Chin. *ta.*
	Louk	Lung	Lepcha, *long* Limbu, *lung.*
	Deiktahseu		Literally *sweet salt.*
	Meu	Mu	
	Hseu	Neu	
	Hle		
	Lazau		
	Poba	Thouthau	
	May		
Take	Siez	Khon	
,, away	Gaso		Literally *return-carry.*
	Leuba, leune	Tahsu	
	Aie	Yo	
Thunder	Laupau		
	Tapaleik	Ka	Bur. *kya.*
	Pgha	Rek	
	Leu	Eu	
	Lateik		
	Khoumoogho		
	Ple		
	Swahteik	Tagua	Bur. *thwa.*
	Te		
	Akheaghauta-ghe		
	Anam	Thena	
	Tu, leu		Chin. *tai.*
	Phusenau	Ting	
	Ha	Lay	Bur. *lay.*
	Sesay		
	Hteik	Htie	Chins. shui.
	Kha		Siam. *nam.*

English	*Sgau*	*Pwo*	*Bghai.*
Wax	Kho	Kho	Khau.
West	Munu	Munu	Munu.
Which ?	Phaylayghalay	Htounglaghalay	Daulaypghaylay.
What ?	Memunulay	Mayhseunaulay	Memanau And metraymay.
Why ?	Bamanulay	Bahseunaulay	Baymanau, and baytrayna.
Who ?	Matataghalay	Paulaghalay	Pgha nauta pghay nau.
White	Wa	Awa	Botha.
Wife	Ma	Ma	May.
Wind	Kalie	Lie	Kalie.
With	Leu, and dau	Leu, & day	Lay.
Woman	Pomu	Heumu	Peumu.
Word	Takato	Hseukhlaing	Tayapo.
”	Kalu	Loo	Le.
Yellow	Bau	Bang	Ba.
Yes	Eu, or me	Eu, or may	Eu, or me.
Young	Thasa	Thabang	Thasay.
Year	Nie	Neing	De.
Yam	Nway	Nway	Nway.

Mopgha	*Toungthu*	*Remarks.*
Khoo		
Meune		Lit. *sun-enter.*
Playlay plau-lay	Hsamaynay	
Memanaylay	Hsomaynay	
Baymalay		
Plelaghalay	Pamaynay	Chin. *mut.*
Gwa	Bwa	
Ma		
Lalie		
Lay		
Feumeu		Chin. *myu*
Laluk		
Bo		
Eu, or me		
Tasa		
Nie, and de		
Nway	Nwa	

NUMERALS.

English	*Sgau*	*Pwo*	*Bghai*	*Red Karen*
One	Ta	La	Ta	Ta
Two	Khie	Nie	Kie	Ne
Three	Theu	Thung	Theu, or teu	Theu
Four	Lwie	Lie	Hwie	Lwie
Five	Yay	Yay	Yay	Nya
Six	Khu	Khoo	Theutho	Theutho
Seven	Nwie	Nwe	Theuthota	Theuthota
Eight	Kho	Kho	Lwietho	Lwietho
Nine	Khwie	Khwie	Lwiethota	Lwiethota
Ten	Tahsie	Lahsie	Tashie	Tashe
Eleven	Tahsieta	Lahsiela	Tashieta	Tasheta
Twenty	Khiehsie	Niehsie	Kieshie	Neshe
Hundred	Takaya	Laya	Takayay	Tayay
Thousand	Takahto	Lahtaung	Takahtau	Tarie

Taru	*Mopgha*	*Toungthu*	*Remarks*
Mau	La	Ta	Tal. *mu-a*
Neu	Schheu	Nie	Shan. *htsoung*
Tu	Teu	Thung	Tibet. *sum*
Lwie	Lwie	Leet	Limbu. *lish*
Gnay	Zay	Gnat	Bur. *gna*
Hso	Khu	Thu	
Nway	Um	Nwot	Limbu. *nush*
Hsoo	Kho	That	Lepcha *kakeu*
Kwie	Khwie	Koot	Shan. *kowt*
Hseu	Lashie	Tasie	Chin. *shi*. The first root is *one*.
		Tasieta	
	Schheushie	Niesie	
Aya	Laza	Talyea	
Alie	Lahto		

Remark. In this paper *oo* represents the English sound.

ay	,,	,,	
e	,,	the Continental	,,
eu	,,	,,	,,

The long and short vowels are not distinguished, nor are the intonations which distinguish words in Karen that have the same vowel. For the general comparison of languages, it has not been deemed necessary to distinguish them, and to do so would involve the use of many diacritical marks which would confuse the manuscript.

Coin Collections lost during the rebellion.—By GEORGE H. FREELING, ESQ., B. C. S.

It is in consequence of the great stress laid by all who have written on Indian Numismatics including Wilson, Cunningham and Thomas, on the locality in which the coins of any race or dynasty are found, that I am induced to notice the dispersion of my own collection at Allahabad during the late troubles there.

In many cases, and particularly as regards the later Bactrian or Indo Greek reigns, the principal or only means we have of determining the area over which the sovereigns by whom they were struck held sway are the coins themselves and the places of discovering them, and the fact of many of one series being procured far away from their usual seat may lead into error those who found theories on and argue from such a basis.

The collection in question was, as noticed by Mr. Thomas in his paper on Gupta coins published in the Journal in 1856, chiefly made at Hamirpore in Bundlecund, and was naturally in great measure formed of specimens obtained in the Doab, the appearance of which at Allahabad or in its neighbourhood would excite no surprize, and call for no remark. But it had been enriched by many contributions from the westward, particularly Muttra, and the purchase of a small collection made at Peshawur and another belonging to the late General Palmer had added a large quantity of those usually termed Bactrian, and Indo-Scythic, the latter especially being very numerous and finely preserved, many too with the original rust on them, which of itself might be sufficient to lead a purchaser to believe they had lately been dug up in the vicinity.

There were likewise many of the rarer species of those commonly called the Bull-and-horseman, denominated by Mr. Thomas the "coins of the kings of Cabul," and chiefly procurable in the Punjab, or even further north. Sassanian and Cashmere coins with many others from the same direction were included in the loss.

I would also notice at the same time that a second cabinet has been dispersed during the mutinies, that of Lady Sale; it was in the possession of Mrs. Holmes, who with her husband was murdered by the Irregulars at Segoulie; they then plundered her property, among which were the coins in question. Never having been fortunate enough to see the collection myself, I cannot give any specification of its contents which, however, were, I believe, rather rare and choice than numerous; all, save a few copper pieces, have now disappeared.

A Register of the Temperature of the Surface of the Ocean from the Hooghly to the Thames.—By A. Campbell, Esq., M. D.

To Major H. L. Thuillier,—*Deputy Surveyor General, Calcutta.*

Sir,—On leaving India for England in February 1856 I received through your prompt and kind assistance two Thermometers from Government to enable me to keep a register of the temperatures of the ocean for M. Hermann Schlagintweit, and the Asiatic Society. I kept the register faithfully all through the voyage from the Sandheads of the Hooghly till we entered the Thames, a copy of this register with a chart of the voyage of the *Agamemnon** was forwarded with the annexed letter to Colonel Sykes, the Chairman of the Honorable the Court of Directors, and I have the pleasure to forward a duplicate of it for the information of the Asiatic Society.

* Shewing the daily position of the Ship at Noon.

For the delay in doing so, the Society will, I hope, excuse me. The period that has elapsed since I rejoined my station in the end of May last, has not been favourable to thinking of such matters.

I am, yours very truly,

A. Campbell, M. D.

Darjeeling, January 21*st*, 1858.

To Colonel Sykes, *Chairman, &c., East India House, London.*

Sir,—Previous to my departure from India I was requested by H. Hermann Schlagintweit to keep a register of the temperature of the surface of the ocean on the voyage round the Cape of Good Hope, as such a register was a great desideratum to him in connection with his other Meteorological researches in the East.

2. Having been furnished with Instruments for the purpose by the Government of India, I made the required observations, which are herewith forwarded, and have now to request that you will do me the favor to take charge of them for Mr. Schlagintweit.

I have the honor, &c.,

(Signed) A. Campbell, M. D.

Memoranda on the Register.

1. Register commenced on the day after we left the Pilot, 21st February, 1856.

2. On the 2nd of March at the time of both observations the temperature of the sea was 2° higher than that of the air, viz. 82° and 84°. This being the first time I had observed this result. I

made double observations, i. e. I registered the air and sea from both Thermometers alternately. The result was the same.

3. On the 29th at 3 P. M. the air and sea were 86°. At 6 P. M. a squall came on with heavy rain, which lasted, the rain, for 6 hours. This cooled the *air* from 86° to 82° but the temperature of the Sea fell 2° only in the same time.

4. On the 3rd at 3 P. M. the air was 85° the sea 86°. We had a squall and a shower of a rain at 8 P. M.; on the 4th at 9.30 A. M. the air had fallen to 83° the sea to 84° only.

5. Since we approached the equator i. e. since we passed 5° North, I have observed that the mercury does not fall more than 2 degrees from the evaporation of the moisture on the instrument. North of 12° it used to fall 6 degrees.

6. For the first 7 days the observations were taken on the main deck at the Poop-ladder in the shade, since then they have been taken in a starboard Poop Cabin aft the Cuddy with open port and jilmills; and I think that the situation is preferable from equability of shade to the deck, or any other part of the ship for registering the temperature of the air.

7. In the Indian ocean we found the South East trade blowing in the 8th degree of S. Latitude, and we left it in 27°.

8. To the *West* of the Cape we found the South East trade in 31° and left it in 1° South.

9. Found the North East trade in 6° North and carried it to 25°. Found the sea weed in Latitude 19°, Longitude 39° West and lost it in Latitude 31°.

10. On the 21st of March Latitude 24° 38′ Longitude 54°-42′ the morning was calm, Thermometer in air at 9½ A. M. 80°, sea 79°. At 2 P. M. we had a squall from the South West which reduced the temperature of the air to 76° at 3 P. M., but the temperature of the sea was 80°. It had risen 1 degree before the squall, I presume, and had not diminished by 3 P. M.

11. On the 25th March in Latitude 29° 51′ Longitude 40° 17′ we had the wind from the North, a land wind from the Island of Madagascar. The Thermometer in air at 9½ A. M. stood at 79°; the temperature of the sea was 75½. At 3 P. M. the temperature of the air was 82° (sea 80°) or 7° higher than on the preceding day when the temperature of the air at the same hour with the wind from the South East was 75° only. On the 26th the wind was again from the South, the air fell to 77°, but the sea had not cooled with equal rapidity, and stood at 79°. A. CAMPBELL.

Register of the Temperature of the Surface of the Ocean kept on Board the Ship "Agamemnon," Captain Hyne, *on her voyage from Calcutta to England in* 1856.—*By* Dr. A. Campbell.

Date. 1856.	Air. 9½ A. M.	Air. 3 P. M.	Sea. 9½ A. M.	Sea. 3 P. M.	Latitude at Noon.	Longitude at Noon.	Wind.	Remarks on the weather, &c. &c.
Feby. 21	76½	80	77	77½	19-44	88-36	N. W.	Light breeze. Run till noon 88 miles.
,, 22	80	82	80	81	18-36	88-33	N.	Calm and hot. Run 50 miles.
,, 23	79½	81	79	80	17-16	88-20	N. E.	Fine breeze. Run 70 miles.
,, 24	79	82	79½	81	15-17	87-56	N. E.	Ditto ditto. Run 122 ditto.
,, 25	82	84	81	82	13-33	87-31	N. E.	Light breeze. 106 ditto.
,, 26	82	84	81	82	11- 2	87°	N. E.	Fine breeze. Run 151 miles.
,, 27	83	84	83	83	8-34	86-59	E. N. E.	Ditto ditto. Cloudy and damp. 150 miles.
,, 28	84	84	83	84	6-17	86-10	E. S. E.	Calm and damp till noon. 146 miles.
,, 29	85	85	84	85	3-10	84-52	E.	Fine breeze. A few drops of rain. 205 miles.
March 1	85	86	84½	86	N. 50	83-44	E. S. E.	Light breeze. Lightning, squalls, a little rain last night, 154 miles.
,, 2	82	82	84	84	S. 37	83-16	W.	Calms and light breezes. 93 miles.
,, 3	83	85	84	86	1-50	83-13	W.	Ditto till 8 P. M. when we had a squall and an 8-knot breeze. 75 miles.
,, 4	83	85	84	85	3-17	83°	N. W.	Light breezes all day. 86 miles.
,, 5	83	86	85	87	4-21	82-49	N. W.	Light breezes 65. Ditto.
,, 6	83	84	84½	86	5-10	83-40	W.	Very light Ditto, squall last night, 79 miles.
,, 7	83½	86	85	85	6-21	84-47	N. W.	Calm, 90 miles.
,, 8	84	87	85½	87	7- 8	85-23	N. W.	Ditto, 59 miles.
,, 9	84	87	85	87	7-34	85-40	W.	Calm, close and disagreeable, 31 miles.
,, 10	86	85	85½	86	8-15	84-29	S. E	A heavy shower at 10 A. M. S. E. trade wind commenced.
,, 11	83	84	84	84	10-12	82- 3	S. E.	Fine 9-knot breeze. Trade wind steady, 182 miles.
,, 12	83	84	83	83½	12- 2	78- 7	S. E.	Ditto ditto ditto. Run 274 miles, air damp.
,, 13	83	83	83	83	14-24	74-15	S. E.	Ditto ditto. Run 250 miles.
,, 14	83	83	83	82	16-54	71- 2	S. E.	Ditto ditto, 238 miles, cloudy and showery.
,, 15	82	83	81	82½	18-24	68-19	S. by E.	Run 182 miles, damp and showery.
,, 16	81	82	81	82	19-11	66-33	S.	Ditto, 110 miles.

,,	17	80	80	81	82	19-54	63-42	S.	Off the Island of Rodrigues, 168 miles, light breeze and very pleasant weather.
,,	18	80	80	81	81	20-52	61-40	S.	Light breeze, 129 miles.
,,	19	80	81	81½	82	21-55	59-15	S.	Ditto cloudy, 150 miles.
,,	20	80	81	81	81½	23-24	57- 7	S.	Ditto ditto, run 150 miles.
,,	21	80	76	79	80	24-38	54-42	S. W.	A squall at noon after a calm morning. See Memoranda, 154.
,,	22	80	81	81	81	25-42	52- 6	S. W.	Calm, 156 miles.
,,	23	80	80	80	79	26-51	50-13	S.	Easter Sunday. Light breeze 124 miles.
,,	24	80	75	79	76	28-30	47-36	S. E.	Fresh breeze. Squall, rain, thunder and lightning, 171 miles.
,,	25	79	82	75½	80	29-51	45-10	North.	Ditto ditto. See Memoranda, No. 11, 152 miles.
,,	26	77	77	77	79	30-26	44-20	S. W.	56 miles.
,,	27	75	78	78	80	30-45	42- 9	....	A calm, 114 miles.
,,	28	75	75	77	79	30-27	40-17	S. S. W.	Strong breeze, 99.
,,	29	74	77	75	77	31- 3	38- 1	S.	Light breeze, 123.
,,	30	75	77	73½	77	31-41	35-55	N. E.	Ditto ditto, 116.
,,	31	76	74	76	73	33-23	32-12	N. W. & S. W.	Fresh breeze. Run 216 miles.
April	1	77	79	77	78	34-11	27-54	N. E.	Strong breeze. Off Cape Reciffe. 220 miles.
,,	2	73	75	73	72	35-34	23-42	E. and N. W.	Run 222 miles. On Lágullas bank. Colour of the sea changed to green, supposed soundings 90 fathoms. The sea full of animalculæ and emitting a fishy odour. Magnetic var. 30 degrees or 2 and 3-4th points of the compass.
,,	3	72	73	70	70	35-42	20-44	S. E. Off the Cape of Good Hope.	
,,	4	70	70	72	70	35- 9	18-13	S. 295 miles.	
,,	5	67	67	68	67	32-20	15-35	S. Entered S E. trade 173.	
,,	6	67	68	67	68	30-19	13-17	S. E. 253 miles	
..	7	68	68	68	68	28-20	9- 3	S. E.	

Date. 1856.	Air. $9\frac{1}{2}$ A. M.	Air. 3 P. M	Sea. $9\frac{1}{2}$ A. M.	Sea. 3 P. M	Latitude at Noon.	Longitude at Noon.	Wind.	Remarks on the weather, &c. &c.
April 8	69	70	68	78	26-40	6-17	S. E.	Run 179 miles.
,, 9	70	71	70	71	25-35	5- 8	S. E.	Very light breeze, 89 miles.
,, 10	70	71	70	71	24-14	3-20	S. E.	Ditto ditto 129.
,, 11	72	74	72	$72\frac{1}{2}$	22-51	1-36	S. E.	127 miles.
,, 12	73	73	72	73	21-38	0-28	S. E.	Cloudy, 97 miles.
,, 13	73	71	73	73	20-37	1- 0	E.	Run 104 miles.
,, 14	75	74	74	74	19-21	2-36	S. E.	117 miles.
,, 15	77	75	75	75	17-17	4-21	S. E.	Cloudy 160 miles.
,, 16	75	75	75	75	15-56	5-44	S. E.	Off St. Helena. Cloudy and showery.
,, 17	75	75	75	75	....	....	S. E.	Ditto ditto ditto, grapes, peaches, pears, figs, apples, plantains in season.
,, 18	77	77	77	77	14-12	7-13	S. E.	Fine breeze. Left St. Helena at 3 P. M. yesterday. Run 158 miles.
,, 19	$77\frac{1}{2}$	78	$77\frac{1}{2}$	78	11-58	9-48	S. E.	Run 183 miles.
,, 20	79	79	79	79	9-32	11-44	S. E.	Cloudy 187 miles.
,, 21	$81\frac{1}{2}$	80	81	80	7-32	13-53	S. E.	Clear. Off the Island of Ascension 177 miles.
,, 22	82	83	82	82	5- 7	16-15	S. E.	Fresh trade. 200 miles.
,, 23	82	82	81	81	2-54	19- 0	S. E.	Squally weather with showers 212.
,, 24	79	81	80	81	-42 S.	20-18	E.	Unsteady trade. Rainy, run 155 miles.
,, 25	83	81	83	83	1-48 N.	21-12	E.	Trade gone. Squalls and rain by which the air fell to 81° at 3 P. M. but the water had not time to cool to the same extent. Run 159 miles.
,, 26	81	80	82	82	2- 8	22-32	Calm.	
,, 27	83	83	83	84	3- 8	23-36	S. W.	Run 87 miles. Calms and squally.
,, 28	80	82	82	82	4-12	23-58	S. E.	Squalls and rain during the night. 68 miles.
,, 29	81	79	81	79	5-27	25 23	N. E.	Rain. Run 114 miles. Entered N. E. trade.
,, 30	80	80	79	80	6-35	27-59	N. E.	Fresh breeze, 172 miles.
May 1	80	79	78	78	8-50	31-12	N. E.	Fresh trade. Clear. 235 miles.
,, 2	77	78	77	77	11-21	34-16	N. E.	Steady ditto 237 miles.
,, 3	78	77	75	76	14- 4	36-50	N. E.	Ditto ditto 232 miles.
,, 4	78	77	76	76	17-36	39-22	N. E.	Fresh trade. 258 miles. Sun vertical in 16°.

,,	5	77	77	76	76	21-24	40-24	N. E.	Ditto ditto. Sea weed abundant. 236 miles.
,,	6	76	75	75	75	24- 1	41- 0	N. E.	Slack trade. 160 miles.
,,	7	75	75	74	74	26-22	40-29	S. E.	Light breeze. 146 miles. Sea weed abundant.
,,	8	74	74	73	73	28-50	38-20	S.	Rain. 199 miles.
,,	9	73	73	72	72	30-25	36-57	S. E.	Light breeze. Less sea weed. 120 miles.
,,	10	73	72½	71	70	31-41	36-45	S. E.	Ditto ditto.
,,	11	71	71	68	68	33- 1	36- 1	S.	Ditto ditto. Sea weed gone. 87 miles.
,,	12	66	66	65	65	34-27	37-22	N. E.	Very fresh breeze. 114 miles.
,,	13	63½	64	63	64	36-38	38-42	E.	Ditto. 113 ditto.
,,	14	63	63	62	63	38-45	39-21	E.	Moderating. 130 ditto.
,,	15	63	66	62	62	39-28	37-45	S. W.	The change of wind raised the temperature at the air to 66° between the 1st and 2nd observation, but had not time to affect the water. 87 miles.
,,	16	63	63	62	64	40- 7	35-36	S. W.	Light breeze. 107 miles.
,,	17	61	62	59	60	41-40	31-48	S. W.	Fresh breeze 199 miles.
,,	18	61	62	59	59	43-1	27-33	S.	Ditto ditto 207 ditto.
,,	19	59½	59	57	57	44-29	22-58	S. W.	Ditto ditto 217 ditto.
,,	20	58	58	56	55	45-52	18- 3	W.	Ditto ditto 225 ditto.
,,	21	57	58	55	55	47- 6	12-23	S. W.	Ditto ditto 226 ditto.
,,	22	56	56	54	54	48-26	7-46	S.	Ditto ditto 222 ditto.
,,	23	55	53	53	51	50- 0	....	S. E.	Off the Isle of Wight. Run 270 miles.
,,	24	56	57	52	53	....	....	....	Off the Isle of Sheppey at noon and anchored at Gravesend at 7 P. M..

May 24th, 1856.

Description of a new species of Himalayan Mole, Talpa Macrura.—By B. H. Hodgson, Esq.

In preparing a set of skins and sculls for despatch to Europe I find a marked species of Mole which has not been I think described, and which differs from the ordinary Himalayan one by being a third smaller yet having a tail five times as long. The following is its summary description.

Tip of snout to base of tail, 4 inches. Head $1\frac{1}{8}$ inches. Tail and hair, $1\frac{1}{4}$ inches, tail only, $1\frac{1}{16}$ inches, palma and nails, $\frac{3}{4}$ inch, planta and nails, $\frac{3}{4}$ inch.

Its colour is deep slaty blue, with canescent gloss, iridescent when wet.

The tail is cylindric and pretty well covered with soft hair which extends a little beyond its tip. As I called the other Micrura, so I name this one Macrura.

Moles are very abundant in the Himalaya, the deep bed of black vegetable mould, every where prevailing (so long as its protecting cover of forest and brush-wood is not cleared off), affording a plentiful supply of those earth-worms which constitute the Mole's chief food.

The abundance of Moles therefore gives a distinct clue to the surface character of this gigantic system of mountains, or rather to the Indian slope of it, and most especially to the central or normal region.

A Twenty-Fifth Memoir on the Law of Storms in India, being the H. Company's Steamer Pluto's Cyclone in the Gulf of Martaban 23rd and 24th April, 1854.—By HENRY PIDDINGTON, *President of Marine Courts.*

This Cyclone is on many accounts a very remarkable one and a great addition to our knowledge of that yet uncertain part of our science, the tracks of Cyclones in narrow confined seas; and the vicinity of an active volcano to one part of what appears to have been its singularly curved track, and its intense violence and limited extent make it one of great scientific as well as of mere utilitarian interest. I give first the abridged documents relating to it beginning from the South as usual, and then a table of them and a detail of the conclusions upon which the track is laid down.

Abridged Log of the Ship ARATOON APCAR, *Capt.* CONNIEW, *from Singapore bound to Calcutta. Reduced to Civil Time.*

The *Aratoon Apcar* was at Noon on the 28th April, 1854, in Lat. 7° 23′ N.; Long. 97° 44′ East with the island of Pulo Rájah bearing E. N. E. 35 miles. Daylight gloomy with lightning. Noon fine and light airs Northerly. P. M. to midnight standing to the N. W. b. N. with light variable airs to 8 P. M. when steady S. W. breeze. At sunset a *heavy swell from the Southward.** Midnight fresh breeze S. West, passing clouds and heavy puffs.

By Noon 22nd April.—The ship had run up to Lat. 10° 53′ N.; Long. 95° 59′ East with winds of variable force from calms to stormy breezes and squalls, variable and Southerly throughout. Her Barometer had risen from 29.90 at 11 P. M. on the 21st, to 30.00 at Noon of the 22nd. The sea is marked throughout as "a high cross sea," "a terrific sea," and "a most turbulent sea keeping the decks awash," and at 8 P. M. on the 21st, though a calm, it is marked as "a turbulent sea breaking in all directions," and a protest is entered in the log of the 22nd and 23rd on account of it. By midnight 22nd and 23rd Barometer had fallen to 29.70. Gale "very fresh" and a high sea spoon drift and sea passing like a sheet of

* I note in italics this singular swell as it occurs on successive days, and shall refer to it in the Summary.

water over the vessel. During these two days ship running up to the N. W. b. W. and N. W. ½ N. from 2 to 8 knots. The wind is marked at 1 P. M. on the 23rd as "Southerly."

On the 23rd April.—4 A. M. cruel weather. 7 A. M. wind marked S. W. sea making a clean breach over the vessel and described as awful; the ship was now under storm sail. Barometer at 29.60 at 6 A. M.; Noon no position given; Lat. by Acct. 12° 47′ N.; Long. 94° 29′ East; P. M. wind becoming more Westerly, and by 8 P. M. moderating to light breezes; at 10, wind S. W. a 2-knot breeze only, and at 11 the Barometer is marked at 29.80. At Noon 24th, Lat. 14° 6′ North; Long. Chr. 94° 33′ East.

Abridged Log of the H. C. Steamer PLUTO, *Capt.* S. G. BOON, *Commander, from Moulmein to Rangoon. Civil Time.*

The *Pluto* left Moulmein on the 21st April, 1854, having on board a detachment of European Artillery with officers and followers, in all one hundred and fifty-five persons with their baggage designed for the relief of the garrison of Bassein. The weather is described as thick and gloomy, increasing at midnight with light rain at times and a cross swell from the S. Eastward. Wind varying from S. East to West. The Barometer at Noon was at 30.00; Aneroid 29.77; Sympiesometer 30.00. At midnight Bar. 30.00; Aneroid 29.78; Sympiesometer 30.35; Ther. 81°. This kind of weather it is remarked in Capt. Boon's report is usual at this period of the year.

22nd April.—A. M. a long Southerly swell; at 4, fresh breezes S. E. and threatening weather; Bar. at 5. A. M. 29.87; Aneroid 29.40; Symp. 30.25; Ther. 81°. Daylight, weather as before, vessel labouring much, steering to the S. W. ½ S. with a heavy Southerly swell. At 8, more moderate. At Noon, moderate but gloomy; Bar. 30.1; Symp. 30.10; Ther. 81°. Lat. Obs. 15° 30′ N.; Long. 96° 9′* East. P. M. light breezes Southerly and cloudy with a S. Westerly swell. 3 P. M. saw Point *Baragua* from the mast head bearing W. N. W.† distant about twenty miles. Soundings at 2

* 95″ 9′ in the log which would have placed the vessel to the Westward of the points.

† W. S. W. in the log and official reports but W. N. W. is no doubt meant

P. M. 14 fs. and at 4 P. M. 11 fs. At 4 P. M. Bar. 30.00; Symp. 30.10; Ther. $84\frac{1}{2}$°. A strong Northerly current; at 4 P. M. wind marked S. East, swell increasing from the S. West. Sunset gloomy and threatening, made all possible preparations for bad weather, vessel steering out to the S. S. W. At 8, increasing breezes from S. East, dark gloomy weather with passing showers and lightning; Bar. 29.90; Symp. 30.00; 9 P. M. Bar. 29.80; Ther. 84°; Symp. 29.90; wind marked S. East at 9 P. M. Every appearance of a gale in the Gulf to the S. West of the vessel; altered course to S. East with a view of clearing its track; sea increasing to midnight, when blowing a gale from S. East with passing light rain *and sheet lightning,* Bar. 29.60; Ther. 83°; Symp. 29.70; Aneroid 29.60.

23rd April.—A. M. heavy S. East gale, Artillerymen pumping, as the Engine could not keep the bilge-pumps going fast enough; 4 A. M. Bar. 29.40; Ther. $84\frac{1}{2}$°; Symp. 29.60. Sea increased and now mountainous and confused, horizon at times no where visible from the height of the waves; 5 A. M., ship unmanageable and in danger of foundering; threw all the deck baggage overboard; 6.30 A. M. ship more buoyant.

At 7 A. M. a lull of 15 minutes; securing masts, funnel, &c. for a shift of wind, Bar. 29.09; Ther. 84°; Symp. 29.20; Aneroid 29.10. *Observed the Bar. rise and fall* 1 *inch.** Much sheet lightning; saw sea birds about the ship and noticed *the water effervescing alongside.*† At 7h. 15′ wind shifted to the N. W., blowing with indescribable force; boats, bulwark and paddle-box blown away. Lashed the helm a lee as the men could not stand the violence of the wind and spray. All hands lying flat on the deck holding on to the bolts, &c. under the lee of the weather bulwarks; impossible to move along the deck without crawling on all fours. *Bar. oscillating very much* and finally settling at 28.40. Obliged to desert the pumps from the fearful violence of the wind. Ship buried in the sea. Foremast invisible from the funnel from the sheets of spray.

as W. S. W. would place the vessel in 4 fathoms water to the North of the Krishna shoal. I subsequently learned that these were clerical errors.

* From 29.09 to 30.09 and falling again instantly as specially noted in Capt. Boon's official report.

† The italics are mine throughout this log.

All who were exposed felt it exceedingly cold during the height of the hurricane and experienced a most painful sensation about the face particularly in the eyes. Could not throw the guns overboard; sea one mass of foam and spray; 11, Bar. rising, wind abating and shifting to the westward, 2 feet 9 in. of water in the hold when we could sound the well. Noon Bar. 29.9;* Ther. 84°; Symp. 29.40. Weather moderating fast; P. M. wind and sea moderating; Bar. 29.40; Symp. 30.00; Ther. 83°. Finding that the vessel was much damaged and leaky and that it was useless to take on the troops without their baggage and accoutrements put back to Moulmein, and by midnight the weather was perfectly fine.

At Noon on the 24th.—Lat. 15° 12′ N.; Long. 96° 52′ East shewing a set of sixty miles to the South during the hurricane. In his official report, Capt. Boon states that he considers the centre to have passed up between the Rangoon and Sitang Rivers.

I forwarded a set of queries to Capt. Boon regarding this Cyclone, to which he and his Chief and second officers have been good enough to give me the replies noted below.

Queries forwarded to Capt. Boon *with his replies and those of his Chief Officer Mr.* Harton *and Second Officer Mr.* Gales.

The Sky Clouds, &c.

Query No. 1.—*What was the appearance of the sky during the Cyclone and specially during the lull. Was there any clear space in the zenith?*

Capt. Boon.—The sky was dark and lowering with very little scud, I particularly observed that there was no clear space in the zenith during the lull, but there was an apparent break in the weather, so much so, that those on board who were unacquainted with the law of storms, prognosticated fair weather, and were much surprised when I informed them that the *Pluto* was in the centre of the Cyclone; it was certainly deceiving, but as I am a thorough believer in the law of storms I made preparations for a shift of wind and bad weather.

Chief Officer.—The sky during the Cyclone was overcast with dense clouds. The night was particularly dark, no stars visible. No clear space in the zenith.

* So in the MSS. probably 29.09 is meant.

Second Officer.—Gloomy with dark overhanging clouds, there was no clear space in the zenith.

No. 2.—*Was there any remarkable light or darkness? Was the sea luminous. If any light whence was it derived?*

Capt. Boon.—There was no remarkable light and the sea was not particularly luminous. The night, previous to the lull, was very dark, I may say the darkest night I ever experienced.

Chief Officer.—The night was particularly dark. Daylight was a long time breaking. No remarkable light; sea not more luminous than usual when breaking.

Second Officer.—No particular light or darkness farther than I have generally seen in bad weather. No luminous light observed.

No. 3.—*Was there any remarkable lightning during the lull. Describe all the kinds of lightning carefully.*

Capt. Boon.—Flashes of distant sheet lightning at intervals, but no thunder; the lightning was very faint and had the appearance of being a long way off; it came from all quarters of the compass.

Chief Officer.—During the lull very faint long flashes of lightning (reflected light?) No thunder heard.

Second Officer.—Faint flashes at intervals.

The Sea.

No. 4.—*When was the effervescence spoken of in the log first noticed?*

Capt. Boon.—During the lull, and lasted until the wind came from the N. W.; the sea was very confused, rising very high and falling apparently with no progressive motion; the *Pluto* laboured less in the centre than she did in any other part of the Cyclone.

Chief and Second Officers.—During the lull.

No. 5.—*How long did it last?*

Capt. Boon.—About a quarter of an hour.

Chief Officer.—Noticed during the lull.

Second Officer.—About half an hour.

No. 6.—*What was it like? Did it amount to frothing?*

Capt. Boon.—It was like boiling water; it amounted to frothing; it had a white appearance but gave no sensible light.

Chief Officer.—The rising and falling of water in a boiling

cauldron. Bubbles rising to the surface as seen in a pond when stones reach the bottom.

SECOND OFFICER.—At the meeting of two confused tides.

No. 7.—*Did it give out any light?*

CAPT. BOON.—No sensible light; perhaps if it had occurred at night, light would have been observed.

CHIEF OFFICER.—No light.

SECOND OFFICER.—Did not observe any.

No. 8.—*Was there any smell or other sensation from it?*

CAPT. BOON.—No smell or other sensation, excepting we all felt it very cold.

CHIEF AND SECOND OFFICERS.—No.

No. 9.—*Any noise of a peculiar kind such as a hissing or rumbling?*

CAPT. BOON.—No noise accompanied it, there was no hissing.

CHIEF AND SECOND OFFICERS.—None.

No. 10.—*Did the water feel warm or cold? Was it remarkably luminous?*

CAPT. BOON.—I felt very cold and was of course wet through, and my opinion is, that it was the sea water that made us feel cold and not the wind, for it was only when the sea began to make a breach over us that we felt it cold.

CHIEF OFFICER.—Did not try it. Had it (the lull) been during the night we might have seen it luminous.

SECOND OFFICER.—Felt very cold. Did not observe it luminous.

PERSONAL SENSATIONS.

No. 11.—*Describe as particularly as you can the sensation about the face spoken of?*

CAPT. BOON.—The sensation about the face was similar to that experienced in a severe hail storm, when walking against the wind, the eyes were inflamed by the spray, which was very dense, so much so, that at intervals I could see no one. I afterwards felt as if I had been stung by nettles over the face and hands.

CHIEF OFFICER.—Stand facing a hail storm of severity and you have a good description.

SECOND OFFICER.—Sharp and cutting, such as experienced with cold bleak winds in high latitudes.

No. 12.—*Also the cold mentioned? Its temperature if noticed?*

Capt. Boon.—The cold was very severe, as cold as I have felt it in England, the temperature was not noted on deck, those who were battened down below, felt it very hot: the Ther. stood at 80° in the cabin, the Doctor registered the Bar. &c. &c. during the height of the Cyclone.

Chief Officer.—The cold was severe and made my teeth chatter. Thermometer not on deck.

Second Officer.—No.

No. 13.—*Was there any feeling of oppression or exhaustion or other sensations differing from what mere fatigue would have produced, as for instance that of excitement?*

Capt. Boon and Chief Officer.—No.

Second Officer.—Cold very intense.

No. 14.—*Were any persons on board affected after the Cyclone had ceased, more or differently, from what fatigue alone would account for?*

Capt. Boon.—No one was particularly affected to my knowledge, sores broke out about the legs and feet of the 1st and 2nd officers and 1st Engineer. I was much exhausted, and considerably reduced, but that I attribute to exposure as I was on deck full forty-eight consecutive hours without sleep or food, and of course very anxious; I also felt much excited for some two or three days after I arrived in port.

Chief Officer.—The soles of my feet cracked and smarted with the salt water, felt the eyes very sore from the salt spray.

Second Officer.—A few persons complained of sores on the feet and legs, also painful sensations over the face and eyes, and mostly all of fatigue.

No. 15.—*Add any other notes, force of the wind, &c.*

Capt. Boon and Chief Officer.—Force of the wind was 12.

Second Officer.—Indescribable.

No. 16.—*When the shift of wind to the N. W. came on, were there any screaming or roaring noises with it?*

Capt. Boon.—When the N. W. wind came on, it was accompanied by a fearful roaring noise, the heaviest thunder could not have been heard. I can only compare the wind to a metallic substance pressing against the vessel; in fact I thought at one time

the sides of the *Pluto* would be blown in, she heeled right over her broadside and remained in that position for four long hours, the roaring of the wind was similar to a powerful steamer blowing off steam. If I had not been prepared for the shift to the N. W., funnel and masts must have gone; I think if we had not had wire rigging, the masts must have gone and perhaps the vessel.

The Barometer stood high when we left Moulmein river, but the weather looked dirty, but not more so than you would expect in the S. W. monsoon, even when I sighted the land about Barazie there was nothing extraordinary in the weather.

They had the wind at Moulmein, first at S. E. and then S. W. it was hardest there at S. W. I found that the trees blown down there fell to the N. E. I forgot to mention that the Master Attendant of Moulmein on the very day of the hurricane went out to sea in the *Trusty* Schooner; so little did he expect a hurricane! If I had gone to the E. N. E. when I discovered the track of the storm was N. E. how should I have had the wind? Would it not have veered to the South and S. W. and West? I should not have been *far* from the centre, and, if the wind veered to the Westward, I should have had a dead lee shore, shoal water, and an unmanageable ship; I think the wind would have more power over the hull of the *Pluto* than the current, as I have often noticed as well as others who are accustomed to the small iron vessels, that when lying in a tide-way they will remain wind-rode, while other and larger vessels are riding with the tide. There was only one way I fancy of avoiding the hurricane, and that was jammed up by the land.

Chief Officer.—Saw it coming from the N. W. and heard it blow with indescribable violence.

Second Officer.—Heard it approaching with great noise, but no screaming.

Abridged Log of the H. C. Light Vessel Tavoy, *Mr.* S. W. Hazlewood, *Commanding Officer. Off Elephant Point.*

21*st April.*—At 10 a. m. severe squall from the S. East, during the day fresh breezes E. S. E. to S. East with heavy rain as noted. At 6 p. m. weather "looks threatening" and at 10 p. m. "a nasty sea is getting up."

22nd April.—Wind marked E. S. E. till 2 P. M. when N. East. Strong breezes and hazy weather with severe squalls occasionally. At 10 P. M. weather is noted as "clearing up for an hour, but soon looked as black as before." Preparing for bad weather.

23rd April.—About 7h. 30m. A. M. commenced blowing very hard from the E. S. Eastward and very shortly blew a perfect hurricane till about 1h. 30m. P. M. when the wind veered rapidly to N. N. W. and blew harder than before. It was not more than five minutes in veering or shifting from E. S. E. to N. East, North and N. N. W. The sea became frightful, tumbling and tossing about in a most dangerous and remarkable manner. *Tavoy* made very bad weather, lost boats, &c. and crew utterly paralysed through fear. At 4, wind West and moderating. At midnight fine.

Memorandum.—No barometrical observations are unfortunately given with this log.

Abridged Report fram Capt. H. LEWIS, *Master Attendant, Rangoon.*

SIR,—I have the honor to report to you the occurrence of a severe Cyclone on this coast; and am only sorry that I am unable to give you a clear or minute detail of the changes of wind or Barometer, as my presence was required nearly the whole time on the river and its banks. I have examined the Log Books of the several vessels that were within its influence, but from only two of them (the *Hannah Kerr* and *Laidmans)* have I been able to obtain any information on the subject, and this but very slight; no barometrical notices have been made by the *Hannah Kerr.*

At Rangoon, on Friday and Saturday the 21*st and* 22*nd of April.*—We had threatening weather, cloudy with slight rain and occasional strong gusts of wind from the Eastward. Barometer fell $\frac{2}{10}$ *and Sympiesometer during the afternoon of Saturday oscillated considerably,** the tide was much higher than usual for the age of the moon.

Sunday, 23rd.—Commenced with heavy rain, wind blowing in gusts from East to S. E. Barometer falling rapidly; about 11 A. M. wind N. E.; 1 P. M. North; about 2 P. M. *shifted* with great violence to N. W. Barometer at this time 29.42 and Sympiesometer 29.47,

* The italics are mine. H. P.

the river rose 6 feet, and had it been at the height of the springs the whole of Rangoon would have been flooded.

The *Hannah Kerr* from Glasgow with 700 tons of coal, in Lat. N. 15° 10′ Long. E. 94° 42′ at 8 P. M. had a strong gale from the East.

Sunday.—4 A. M. a severe hurricane from S. E. veered round to N. W.; close-reefed topsail blown away; very high sea running. Noon moderating.

The *Laidmans* from Rangoon, homeward bound, had to cut away main and mizen masts to save the vessel. Enclosed is a printed extract from her Log book.

This vessel saw the spars and deck planks of a vessel, supposed to be about 500 tons; yards, masts and studding sail boom-ends painted white.

The *Shawool Hammed* from the Nicobars was totally dismasted about twenty miles to the Southward of Ballagore Point.

Several other vessels have arrived since, more or less damaged, but I fear we have not yet heard the worst. Several native kuttoos and junks were wrecked close to the mouth of the river, and one schooner, the *Wave*, went down at her anchors in the river.

The heaviest of the hurricane was felt to the Eastward of this between Rangoon and Moulmein, and as yet we have no news from that quarter.

Extracts of the LAIDMANS' *Log.*

"*Saturday, April* 22*nd, Nautical Time.*—P. M. commencing with light variable airs, 5 P. M. set main top gallant sail, 6 P. M. single reefed the topsails, middle part hard squalls and heavy rain attended with thunder and vivid lightning and a heavy swell from the Southwestward. Ship labouring heavily and making more water than usual, 10 A. M. Wore ship to the S. Eastward, set the spanker and main spencer."

Here it is evident that they had the first token of the gale, and the following day, as appears by the Log Book, was the one on which the accident occurred and which compelled her to bear up and return to this port.

"*Sunday, April* 23*rd.*—P. M. commencing with strong winds and squally, veering from East to South with a heavy sea from the South-

ward. Ship leaking very much. Pumps closely attended to. Barometer 29.60 2 P. M. Wind increasing, in jib and mainsail and 2nd reef of the topsails. Barometer 29.50. At 4 P. M. wind S. E. wore ship to the S. Westward. Wind and sea increasing. Ship leaking much more. Pumps closely attended to. Observed the water coloured. Barometer 23.50; and at 6. P. M. 29.20. The gale and sea increasing. In all, but the close-reefed topsails and foretopmast staysail. Heavy seas breaking on board and could not stand properly to the pumps. Midnight, strong gales, and terrific squalls with a heavy sea running, ship labouring and straining very much, carried on the close-reefed topsails to get the Prepris channel open. Barometer 29.10. At 4 A. M. it blew with fury—the foretopmast staysail blew away; split the foretopsail and main spencer; ship lying over very much, with a dead body of water on deck. Found we could not keep the pumps clear; water gaining on us very fast. Barometer 29.00. At 6.30 A. M. it blew a hurricane, ship laying down on her beam ends. All hands perfectly stupified and could not hear me speak to perform my orders, and it was impossible for them to stand at the pumps. The dead water was lying on deck over the hatches. The Master went below to see the Barometer, when he heard the water running in at the stern and all the cabins afloat. The carpenter was called for, and knocked all the panellings away. He then stopped a very great leak on the starboard quarter; my attention was next drawn on deck, the ship was laying over so that I had great trouble in getting up the cabin stairs and when I did get on deck, I found the wind had veered to the Westward. Barometer 28.90. Lost the foresail in trying to wear ship. Got a studding sail into the forerigging, but found it of no use. It then came on to blow more awfully than before, the ship laying on her beam-ends, and we saw plainly the ship settling down fast. The main and mizen mast were cut away and the ship righted at once and then hauled to the S. S. E. Sounded the pumps and found five feet water in the hold. Set all hands to the pumps."—*Rangoon Chronicle, April 29th.*

Extracts from the Rangoon Newspapers.

RANGOON.

Rangoon was on Sunday last visited by a hurricane, or as the

scientific world will now have it, a Cyclone, of a most violent description.

On Sunday evening the near approach of bad weather was pretty clearly foretold, by the rapid fall of the Barometer. From this time the wind, which was from the S. E., began to increase, accompanied with heavy rain. The storm reached its maximum violence at about 2.30 P. M. on Sunday, when the Barometer fell to 29.42 and Sympiesometer to 29.48, but from daylight in the morning had continued to blow in alarming and destructive gusts, and had veered completely round from its original point, to the North and Westward. Much serious damage has been done in the town attended, we regret to say, with loss of life.

We have only however authentic information of the death of one old man (a milkman) upon whom a beam of his house fell. Many of the pucka buildings which the owners have been so anxious to get completed before the rains, and upon which large sums have been expended—the expenditure being more than doubled by the enhanced price of labour and materials—have fallen down, or are otherwise materially injured, owing chiefly to their not having had time to set, before exposure, first to such a deluge of rain which loosened their foundations, and then to gusts of wind acting on their walls. It has been a severe test for such brick buildings as have escaped.

On the river also much damage has been the consequence. The schooner *Wave* foundered, with loss of three lives, the *Flora* nearly sharing the same fate. All the ships drifted more or less; and hundreds of boats were swamped and lost. The Engineers' Department and Timber Merchants have suffered severely by the breaking up and dispersion of their rafts: as also we believe the Dockyard.

We cannot learn from the oldest inhabitants, that Rangoon has witnessed such a storm before. We trust that its violence did not extend to the gulf of Martaban, or we may anticipate bad news from the shipping outside; and the *Tenasserim* will have had a severe taste of it.—*Rangoon Chronicle, April 26th.*

A Rangoon paper of the 3rd of May contains a further report of the mischief done by the late Cyclone, which we have extracted.

"The *Zenobia* is off in a few hours, so just a line by her. The

Fire Queen is two days behind her time from Maulmain. She has most likely been detained to look for wrecked ships and boats at the mouth of the Sitang river. It is feared that a terrible disaster has happened in the Sitang river. A fleet of thirty-five boats left Maulmain on the 19th ultimo, having on board the Head Quarters 36th M. N. I., and a third of a Company of European Artillery, for Sitang and Shew-geen. They were caught, it seems, in the terrific gale of the 23rd, when about thirty miles below Sitang, one boat's company have reached Pegu, and reported that the bore came mountains high, and caused the whole of the rest of the fleet to disappear. Whether all have swamped, or whether they were driven down the river and out to sea by the gale, which blew from the North, is at present unknown. Elephants with provisions have been sent from Pegu to look for people along the bank of the river. The very worst fears are entertained, but as natives often greatly exaggerate, it is quite possible some of the boats may have been driven ashore on the bank of the Sitang river. The *Fire Queen* must bring in the news to-day.

"*P. M.*, 3*rd May.*—Since writing a few hours ago, the *Fire Queen* from Maulmain has come in, bringing a few particulars of the accident on the Sitang river. Lieut.-Colonel Johnstone, who was proceeding to join his Regiment at Tounghoo, being in a good boat, weathered the bore and the wind, and got safe into Sitang, where, however, he was robbed of all he possessed by the Burmese. He saw, it is said, ten boats with men in them go down, what has become of the other twenty-five boats is not known.

A private letter from Captain G. C. HAUGHTON, *Magistrate at Maulmein gives the following account of the weather at that station.*

On Sunday morning, 23*rd.*—We had wet windy weather and cloudy; wind *I think* N. East; by Noon it was very high at East. By 2 P. M. it was S. East and gradually shifted to S. W.; much rain from Noon. By 4 P. M. it was blowing a hurricane at S. W. and continued to about 7.30, gradually veering Westerly. After 8 P M. it was high at W. N. W. and the wind gradually veered and fell till daylight when we had a moderate breeze at S. East. The oldest trees were rooted up, but all things considered, wonderfully little damage was done to the houses. I thought my house would have

been blown away and had to shore up all the doors and windows S. West to prevent them being blown in.

The track of the PLUTO'S *Cyclone.*

The foregoing comprises all that I have been able to collect in the way of documents I now proceed to say on what grounds I have laid down the track of this Cyclone.

We find that unfortunately the wind is only marked once at 11 P. M. of the 21st (civil time), throughout the *Aratoon Apcar's* log of the 22nd, which is kept in Nautical time, but that throughout the 21st she had unsteady winds varying as to force from calm at sunset to strong breezes at 8 P. M.; then moderate again with gloomy threatening weather at midnight, and at 4 A. M. on the 22nd fresh breezes; but during the whole of the 21st, she had the sea even during the calm at sunset very turbulent and breaking in all directions. We may then fairly suppose that she was with this sea in some part of the wake of the Cyclone, and her falling barometer from Noon of the 22nd would seem to indicate that her N. Westerly course was bringing her within the true Cyclone circle.

We have only at 1 P. M. on the 22nd the wind marked "Southerly" and at 7 A. M. on the 23rd it is marked as S. W., so that as it was blowing a hard gale from midnight we may fairly say that at midnight 22nd—23rd she had run into the Cyclone on its S. Easterly quadrant, and from thence if we take the wind to have been veering gradually that it may have been about S. W. b. S with her at that time, or perhaps even S. S. W., either of which estimates would place the centre of *a* Cyclone to the E. N. E. of her, or somewhere about Barren Island, and vague as this is, I have so marked it for midnight in the Chart for the sake of reference, for, as will be presently seen, the distance is so great that it is impossible to consider this gale and the *Pluto's* Cyclone as the same circular storm.

On the 23rd from midnight up to Noon we find that the *Aratoon Apcar* had the weather very severe and the sea is described as awful. After Noon in this day it appears to have moderated rapidly, but the wind is again most carelessly marked as "Westerly," and we cannot hence pronounce with any degree of certainty that her gale was a Cyclone at all or a mere setting in of the S. W. monsoon.

For it will be seen by the Charts that from the centre, which we

have approximately estimated about Barren Island, for the supposed Cyclone of the *Aratoon Apcar* at midnight 22nd—23rd of May, to the spot where the centre *certainly* passed over the *Pluto* at 7 A. M. on the 23rd is a distance of 222 miles, so that if suppose the Cyclone to be the same storm, it must have travelled at the rate of nearly 32 miles an hour, a far higher rate of travelling than we have yet ascertained for the storms of the Bay of Bengal except in one instance.

The log of the *Laidmans* unfortunately affords us no assistance, as no positions are given, but from what is said she appears to have been dismasted very near to the centre, and not far to the S. Westward of the *Pluto*.

It seems therefore safer to suppose that the *Pluto's* Cyclone was an independent storm, and that that of the *Aratoon Apcar* was also possibly or probably a Cyclone, which either broke up or ran on ahead of the vessel passing out, as in the case of the Erin's Cyclone, Twenty-second Memoir Journ. Asiatic Society of Bengal Vol. XXIII. by the Cocos passage. I have thus marked only a single circle for it, at midnight 22nd—23rd to remind the mariner of the great probability of the Southern, S. Western and South Eastern gales of the open part of the Andaman Sea being quadrants of Cyclones of which the track lies over or near to the two Volcanoes.

We have then only to deal with the *Pluto's* Cyclone which evidently,—and this constitutes its great interest,—came up from the South West, and was travelling to the N. East. It appears to have given as usual its first indications by the increasing swell from the S. West after Noon; by midnight it was a gale from the S. East; but we have no data from which to estimate the distance of the centre at this time, and can thus only mark for it also a circle with a track of an undefined extent in the directions which we fortunately know it to have taken, the centre of the circle being, as nearly as can be estimated, the *Pluto's* position at 7 A. M. when the calm centre passed her.

We next find that at the *Tavoy* light vessel, which is anchored off Elephant point in Lat. 16° 19′ N.; Long. 96° 25′ East at the entrance of Rangoon River, it *commenced* blowing very hard from the E. S. East at 7.30 A. M. on the 23rd, about the time the *Pluto*

had the centre passing her, and that it was veering (or *shifting* says the log) so rapidly at 1.30 P. M. to N. N. W. from E. S. E. that it was not more than five minutes in doing so. Hence there is no doubt that the centre passed close to the Eastward of her, and doubtless, as estimated in the reports from thence, somewhere between Rangoon and the Sitang river-mouths, about 45 miles to the East of her. If we say that the centre bore due East 20 miles from the *Tavoy's* position at 1 P. M. we shall then have, from its estimated place with the *Pluto* at 7 A. M. to this spot at 1 P. M., a distance of about 70 miles for its progress in six hours, or $11\frac{4}{6}$ miles per hour for its rate of travelling, which is not an unusual one, and one founded on fairly estimated data is, I think, far preferable to the forced conclusion of supposing the *Aratoon Apcar's* Cyclone to have travelled at the rate of thirty-two miles per hour?

We have thus the remarkable fact of a small but severe Cyclone forming, or descending perhaps, about Narcondam, since it dismasted the *Laidmans* probably at some distance W. S. West of the spot where its centre passed over the *Pluto* and travelling up *to the N. East* and our Chart, on which I have placed for comparison the former tracks of the *Briton* and *Runnimede's* and of the *Erin's* Cyclones, will shew that, in confined Volcanic seas like this, the tracks are apparently subject to no general rule, at least to none that we can at present venture to predicate.

Other Phenomena.

There was in this Cyclone the usual absence of thunder and the faint lightning described seems to have been more the glaring of strong electrical action than true lightning.

The frothing of the sea during the passage of the centre is by far the most remarkable phenomenon in this Cyclone, and I have endeavoured to elicit, as will be seen in the queries, all possible information regarding it, and Captain Boon and his officers all agree together in comparing the motion of the sea to the seething of a cauldron. I think this has been noticed before? but I cannot now find the reference, and on one occasion in the S. East part of the China Sea between the shoals and the coasts of Borneo, in the month of October after several days of gloomy rainy weather, perhaps from a Cyclone in the Northern part of the sea, I myself observed it to

occur, but in this instance it was more like the bubbling of gas in a spring, than the frothing described by Capt. Boon and his officers.

The Management of the Pluto.

The sailors will not fail to remark, and indeed it excited much attention amongst Nautical men in Calcutta at the time, that this seems to be at first sight the case of an encumbered Steamer, which might certainly, one would think, have got out of the way of the centre, allowing herself to be caught in it to the imminent risk of the vessel and the lives of all on board; but as will be seen by the following letter addressed to the Superintendant of Marine, Capt. Boon did all that his vessel would allow him to do, in the very difficult position in which he was placed.

Captain T. E. Rogers, *Superintendant Marine.*

Sir,—In reply to your demi-official communication with copies of H. C. Str. *Pluto's* log and Captain Boon's letter I have the honor to say.

1. That it is very certain that our knowledge of the tracks of the Cyclones in the Andaman Sea is very uncertain, and that, as quoted by Captain Boon, the only track given in the Horn Book, which is laid down from the (then) only recorded storm, is one from the E. S. E. to the W. N. W. My new Memoir, the 22nd of the series, just sent to you; shews a new track for them, namely from the S. b. E. S. and S. S. E. to the N. N. W. and N. W. b. N. between the two volcanos of Narcandam and Barren Island, and out by the Preparis passage. This memoir however Captain Boon could not have seen. The present Cyclone gives us another and is probably an instance of a re-curving track.

2. Captain Boon very rightly steams for an offing and correctly judges at 9 p. m. that the centre of the Cyclone bears S. W. of him, and this is confirmed by the swell from S. W., but he is necessarily still uncertain as to its track, and, as any one would have done, still steams out for an offing, and so far obtains one that he deepens off the bank to no ground with twenty fathoms, if I read his log correctly ?

3. At midnight, however, there was no doubt of the track of the Cyclone to the N. Eastward since the wind was steady at S. E. and Barometer falling fast, and the steamer had not more than held her

own as to position and the question now became what was best to be done?

4. The ship's *true* position at this time has first to be considered, and, taking into account—

a. The Northerly set shewn by the bearings and soundings since point Baragui was sighted.

b. The heave of the S. Westerly sea.

c. The storm current setting him to the N. West.

d. The storm wave setting him to the N. East.

e. The inset of the flood tide to the Sitang and other mouths of the Delta whenever it made—taking all these considerations into account, then, I think Captain Boon could not have estimated himself as having done more than held his own as to latitude, though he had deepened his water by a few miles of Eastering carrying him off the bank. So that, at most, point Baragui was still bearing W. N. W. or W. b. N. of him. The extreme of the flat more Southerly of course.

5. Theoretically, and as a scientific landsman might suppose, it is true that now (at midnight) with the S. E. hurricane Captain Boon might have wore round and bringing the S. E. gale on his port quarter have dashed past to the Northward of the Cyclone centre, trusting to bring the wind, as he no doubt would quickly have done, to E. S. E., East, and E. N. E., and N. East, and thus enabling him to clear the flat by steaming close round the centre on its N. Western quadrant.

6. But there were many dangers in doing this, such as—

a. Would the vessel steer well enough in a quartering gale with her encumbered decks and the confused sea of a Cyclone? I should doubt it of any paddle-wheel steamer, especially of the old build, unless with the wind nearly right aft, and, in any case, with the frightful seas of a Cyclone, when so near the centre there is constantly an imminent risk of broaching to.

b. She could not start with the gale at S. East on any thing nearer the wind than a W. S. W. course and I doubt if she would have done that? With the influences of which we have spoken in para. 4, a West course made good would be the utmost that any sailor would calculate upon with the wind at S. East at such a time.

d. There was also more danger than an utter want of sea room, for, short of making a S. W. course at least, which for the first hour or two was out of the question, a single hour's run must have carried the *Pluto* into say nine or at most ten fathoms water.

7. And in a Cyclone, this shoaling of the water, it should be held in mind, is a fearful danger. The deep water sea is, we know, terrific, but in small soundings it becomes exactly a *surf* from all quarters, in which nothing can live. I was assured by eye-witnesses in 1812, when the wreck of H. M.'s Frigate *Dover* was yet lying on the beach at Madras, that the *surf* in the great Cyclone of 1809 *broke* in nine fathoms water ; and you yourself, Sir, know well what the sea is at the entrance to Bombay Harbour, if the shore is too closely borrowed on in the S. W. Monsoon. If the *Pluto* then had even cleared the shoal off the point, I think that in any thing less than twelve fathoms, she must have been swamped. It is impossible for the most sanguine to suppose that she could have passed it at that distance ; and to Captain Boon's resolutely steaming out for the deep water, whether it was done in the contemplation of this peculiar danger or not, I think we owe the preservation of the vessel. When the track was ascertained, Captain Boon could not get to the E. N. E. to be a little out of the way of the centre, for his engines were already powerless.

8. The case then altogether appears to be one of those unfortunate ones in which for want of sea-room nothing can be done to avoid the centre ; but the advantage which the law of stormsı ill gives us is that the sailor *knows what is coming*, and, as Captain Boon has most creditably done in this case, takes his precautions accordingly, so far as he can.

I am Sir,

Your's very obediently.

H. P.

Calcutta, May 13*th*, 1854.

PROCEEDINGS

OF THE

ASIATIC SOCIETY OF BENGAL,

For March, 1858.

The Monthly General Meeting for March was held on the 3rd instant.

Hon'ble Sir James Colvile, Knt., President, in the chair.

The proceedings of the last Meeting were read and confirmed.

Presentations were received :—

1. From the Imperial Geological Institute of Austria in Vienna, a complete series of the publications of the Institute, comprising twenty volumes beautifully illustrated.

2. From the Ven'ble Archdeacon Pratt, some valuable Astronomical works.

Letters from J. J. Gray, Esq., R. Cust, Esq., and Dr. Campbell, announcing their wish to withdraw from the Society, were recorded. Mr. Gray stated, that he had written to announce his intention in Nov. last. His letter, however, had not been received.

Mons. R. Schlagintweit was balloted for as a corresponding member of the Society, and declared elected.

The Council submitted the following report :—

The Council beg to recommend that Bryan Houghton Hodgson, Esq., and Dr. H. Falconer be elected Honorary Members of the Society.

Mr. Hodgson has been for twenty-five years a member of the Society, and has been a constant contributor to the Transactions and Journals. His papers published by the Society amount to the large number of 118, embracing the most varied subjects in Philology, Archæology, Geography, Ethnology, and Natural History.

He has at the same time contributed largely to other scientific bodies, and his reputation is widely spread amongst the cultivators

of learning and science, not only in India and England, but throughout the civilised world.

He is a corresponding member of the French Institute, and an Honorary member of many of the other Literary and Scientific Societies of Europe, and has had the honor of being appointed a Chevalier of the Legion of Honor of France, in special acknowledgment of his valuable researches into the History and Philosophy of Buddhism.

Dr. Falconer has also long been a member of the Society. He was for many years Superintendent of the Botanic Gardens of Saharunpore and Calcutta, and is one of the most distinguished naturalists of India, conspicuous as a botanist, and still more so for his labours in palæontology, which have obtained for him the highest honors the Royal Society of London can bestow. Dr. Falconer was one of our most active members, and the Society has recently been under especial obligations to him for arranging and describing their valuable collection of fossil vertebrata, the catalogue of which is now in course of publication.

Communications were received—

1. From Mr. Freeling, a note on his collection of coins lost during the rebellion.

2. From Mr. Chapman, Under-Secretary to the Government of India, forwarding the following memo. shewing the measurements of the native of the Andamans who was recently brought to Calcutta :—

Name—John Andaman.

Sex—Male.

Age—About 25 years.

Native Country—Andaman Islands.

Caste—None.

MEASUREMENTS.

	Feet.	*Inches.*
1. Total height,..	4	$9\frac{1}{2}$
2. Width of the Arms horizontally extended,...	4	1
3. Vertex to the beginning of the hairs of the forehead,..		$4\frac{1}{4}$
4. Vertex to the Orbit,................................		$7\frac{1}{3}$

5. Vertex under the brows, ...		$9\frac{1}{3}$
6. Vertex to the mouth, ...		$10\frac{5}{8}$
7. Vertex under the chin (the head,)	1 by	$\frac{5}{8}$
8. Circumference round the frontal sinusses, ...	1	$8\frac{6}{8}$
9. Vertex to the claviculæ, ...	1	$2\frac{1}{2}$
10. Diameter of the head by the temples,.........		$6\frac{3}{8}$
11. Antero-posterior diameter of the head,......		$7\frac{1}{8}$
12. Interior distance of the eyes,.................		$1\frac{1}{2}$
13. Exterior distance of the eyes,.................		$4\frac{1}{2}$
14. Length of the mouth,............................		$2\frac{6}{8}$
15. Length of the ear,................................		$2\frac{1}{2}$
16. Length of the hand,..............................		$6\frac{1}{2}$
17. Length of the foot,..............................		9
18. Breadth of the hand,............................		3
19. Breadth of the foot,............................		$3\frac{6}{8}$
20. From the ground to the middle of the patella,	1	$4\frac{1}{2}$
21. Diameter by the acromion apophysis,.........	1	$1\frac{2}{3}$
22. Length of the arm from the acromion process,..	1	$6\frac{7}{8}$
23. From the ground to the trochanter,...........	2	$6\frac{7}{8}$
24. Circumference round the calves,..............		$10\frac{2}{8}$
25. Circumference round the knee,................	1	$0\frac{3}{8}$
26. Distance of the malar bones,..................		$5\frac{7}{8}$
27. Breadth of the nose,............................		$1\frac{7}{8}$

(Signed) F. J. Mouat,
President, Andaman Committee.

Dr. Thomson gave an account of his visit to the Glaciers of Kinchinjunga in Sikkim, in October last.

The thanks of the meeting were accorded to Dr. Thomson for his interesting account.

The Librarian submitted his usual monthly report.

Library.

The Library has received the following accessions during the month of February, 1858.

Presented.

Naturwissenschaftliche Abhandlungen Gesammelt und Durch Subscription Herausgegeben von Wilhelm Hardinger, Vols. I. to IV. royal 4to. Wien, 1847.—By the Imperial Geological Institute of Austria in Vienna.

Abhandlungen der K. K. Geologischen Reichsaaustalt, vols. I. to III. *Wien,* 1852, royal, 4to.—By the same.

Jahrbuch der Kaiserlich-Königlichen Ditto, vols. I. to III. royal 8vo. *Wien,* 1855.—By the same.

Berichte über die Mittheilungen von Freunden der Naturwissenschaften in Wien, vols. I. to VII. 8vo.—By the same.

Selections from the Records of the Madras Government, No. XLIV. Report of the Railway Department, 1857, 4to.—By the Madras Government.

Damoiseau's (M. Le Baron de) Tables de la Lune formées par la Seule Théoree de l'Attraction, *Paris,* 1828, folio.—By the Venerable Archdeacon Pratt.

Delambre, (M.) Burg (M.) Tables du Soleil et de la Lune, *Paris,* 1806, 4to.—By the same.

Bouvard's (M. A.) Tables de Jupiter, de Saturne et D'Uranus, *Paris,* 1821, 4to.—By the same.

Lindenaw's (Bernhard de) Tables Nouvelles De Vénus, *Marseilles,* 1811, 4to.—By the same.

———— Tables of Mercury, 2 copies, *Gothæ,* 1813, folio.—By the same.

———— Tables of Venus Eisenberg, 1821, folio.—By the same.

Selections from the Records of the Government of Bengal, No. XXXVII, 2 copies, on Colonization, Commerce, Physical Geography, &c. &c. of the Himalaya Mountains and Nepal, By Brian Houghton Hodgson, Esq. B. C. S.—By the Government of Bengal.

Discours de M Garcin de Tassy, *Paris,* 1857, *pamphlet.*—By the Author.

Zeitschrift der Deutschen Morgenlandischen Gesellschaft, Band XI. Heft 4. *Liepzig,* 1857.—By the German Oriental Society.

Journal of the Statistical Society of London, vol. XX. Part IV. December, 1857.—By the Society.

List of Fellows of Ditto.—By the same.

General Report of the Director of Public Instruction in Lower Provinces for 1850-57.—By the Director.

Notices of the Meeting of the Members of the Royal Institute of Great Britain, *pamphlet,* Part VII.—By the Institution.

The Vividhárta Sungraha, No. 45.—By BABOO RAJENDRALA'L MITRA.

A (Map) Plan of the country bordering the Great Trunk Road between Benares and Delhi.—BY MAJOR H. L. THUILLIER.

The Oriental Baptist for February, 1858.—BY THE EDITOR.

The Christian Spectator for December, 1857.—BY THE EDITOR.

The Calcutta Christian Observer for Feb. 1858.—BY THE EDITORS.

The Indian Annals of Medical Science for January, 1858.—BY THE EDITOR.

The Madras Journal, No. 43.—BY THE EDITOR.

Exchanged.

The Atheneum for November, 1857.

Annalen der Chemie und Pharmacie, October, 1857, Band LIV. Heft. I.

Purchased.

Literary Gazette, Nos. 2131 to 2134.

Journal des Savants, October, 1857.

Comptes Rendus, Nos. 18 to 22, 19th October to 30th November, 1857.

Revue des Deux Mondes, 15th November and 1st December, 1857.

——— et Magasin De Zoology, No. 10.

The Annals and Magazine of Natural History, No. 120.

Annales des Sciences Naturelles, Tome VII. No. 2.

The Useful Plants of India, Part I, *Trevandrum,* 1856, pamphlet.

American Journal of Science and Art for November, 1857, No. 72.

Livingstone's Mission to Africa, 8vo.

British Workman, Nos. 34, 35 and 36.

As. Soc. Rooms, GOURDAS BYSACK,.
The 5th March, 1858. *Librarian and Asst. Secy.*

JOURNAL

OF THE

ASIATIC SOCIETY.

No. III. 1858.

The Great Indian Arc of Meridian, and the Figure of the Earth.—By the Venerable Archdeacon Pratt, *M. A.*

To the Editor of the Asiatic Journal.

Sir,—It is not many days since I had the opportunity of seeing for the first time the Notices of the Royal Astronomical Society for January 9, 1857, which contain a paper with the following title, "*An Examination of the Figure of the Indian Meridian as deduced by* Archdeacon Pratt *from the two Northern Indian Arcs; with a Proposition for testing that form by Astronomical Observations.* By Lieut. J. F. Tennant, Bengal Engineers, F. R. A. S. and First Assistant in the G. T. Survey of India:" and also a continuation of that paper read before the Astronomical Society in June of last year by the same author. The calculation here referred to by Mr. Tennant was made by me while at the Cape of Good Hope in 1854, and is published in the Philosophical Transactions of the Royal Society for the following year. As the calculations and results of that paper have in some respects not been understood by Mr. Tennant, and as the subject is one which appertains to this country, and interests some of your readers, I hope you may not find it inconvenient to insert this letter in your Journal.

Preliminary Remarks on the Figure of the Earth.

2.—It will be necessary to preface what I have to say with a few remarks regarding the Figure of the Earth. After it was known

that the earth is of a globular form, Newton was the first who demonstrated that it is not a perfect sphere. From theoretical considerations, and also from the discovery that a pendulum moves slower at the equator than in higher latitudes, he arrived at the conclusion that its form is that of an oblate spheroid. Modern science has confirmed this, and in several ways determined the depression of the pole to a considerable degree of minuteness; and this is looked upon as well established, because the amount of depression, though determined in ways quite independent of each other, is very nearly the same in all. (1). Upon the hypothesis that the earth was once fluid, and by assuming a (very probable) law of density of its mass, the depression has been found to be 1-300th part of the radius at the equator. (2). By pendulum-experiments made in many parts of the earth, the determination is 1-288th part. (3.) From the effect of the protuberant parts of the earth's mass on the motion of the Moon in latitude and longitude, Laplace made the depression very slightly less than 1-300th. (4.) By the measurement of arcs of the meridian in different parts of the world and the latitudes of their extremities, and comparing arcs in high latitudes with arcs in low latitudes (which has always been considered necessary to eliminate certain errors of observation), the depression has been found to be slightly less than 1-300th of the equatorial radius. These are so nearly alike that the question has been considered settled, that the earth's figure is an oblate spheroid, and that its ellipticity is 1-300th. To be sure we see mountains and valleys, and table-lands and oceans, and every kind of surface. But these have been compared for insignificance to the unevennesses on the coat of an orange, and are indeed still more trifling in comparison.

3.—But both Physical and Practical Geology have brought new ideas to light. Though the earth no doubt was once fluid, it must be countless ages since it was so. The crust, if the mass be not solid to the centre, is of great thickness, as the only real calculations on the subject—those by Mr. Hopkins of Cambridge—show. It is discovered that the earth does not, though solid, preserve an invariable form. It is a well established fact that in some parts its surface is at present undergoing slow depression, while other parts

are rising, and that this alternate action has been going on for ages. The huge mass appears like a gigantic monster heaving its ribs and then drawing them in again, but with a deliberation which can be measured only by something like astronomical or rather geological periods, and through spaces, though minute, yet sufficiently sensible to destroy the symmetry of its form.

4.—It is therefore perfectly gratuitous to assume as has generally been done, that the form of the earth is now an exact spheroid. And when we look back to the methods which have been used with such success to determine the degree of oblateness, it will be observed that they all of them regard the earth as a *whole*, and take no account of its separate parts. Indeed, as I have already intimated, it has long been an acknowledged fact, that the 4th method fails when arcs near each other, and therefore appertaining to any one portion of the earth's surface alone, are compared; and, I believe myself, chiefly for this reason, that the earth's form is not an exact spheroid. The spheroid (of depression 1-300th) which has been determined by these four methods is, therefore, the *average* spheroid; or the spheroid which more nearly represents the earth's irregular form than any other spheroid; some parts being slightly above it, and some slightly below it, owing to the irregularities which have arisen since the earth ceased to be a fluid mass. We can no longer assume that the arcs of meridian are all equal ellipses, or are ellipses at all, or that the arcs of longitude are circular.

Remarks on Mr. Tennant's Papers.

5.—To ascertain the actual form of the different parts of the surface, each part must undergo a separate examination; as the form, though nearly spheroidal, is not exactly so and follows no known law. When we wish to measure the curvature of a curve not differing much from a circle, it is convenient to compare it with the ellipse which most nearly approaches it in form, as the ellipse is the next simplest curve to the circle. Any arc of meridian drawn upon the surface of the earth departs but little from a circle, and may therefore be thus compared. In this comparison, for convenience' sake, the ellipse is so chosen as to have its centre in the centre of the earth and one of its axes coincident with the earth's

axis. The sole quantities, therefore, to be determined are the semi-major axis, and the ellipticity or compression. In the Problem of the Figure of the Earth, the ellipse is a convenient curve of comparison for this further reason, that it was the *exact* form of each meridian when the earth was fluid, or sufficiently fluid to control the external figure.

One of the results of my paper in the Philosophical Transactions of 1855 is the comparison of the curvature of the great arc in India, 800 miles long, lying between Kaliana (latitude 29° 30′ 48″) and Damargida (latitude 18° 3′ 15″); and I find that it coincides most nearly with an ellipse of which the compression is 1-426th; and not 1-300th, the compression of the average meridian—that is, if no cause can be discovered counteracting the attraction of the Himalaya mountains.

6.—Mr. Tennant's object, as announced in the heading of his first paper,* is to *test* this result. But how does he test it? He there proceeds, not to examine my arc, and test it by some other

* I am indebted to Mr. Tennant for having detected a numerical error in p. 98 of my paper.

For $\alpha = -0.0039737 - 0.0051426\, u + 0.0016881\, v$.

Read $\alpha = -00019203 + 0.0059576\, u - 0.0014564\, v$. This will change the value of $a\,(1 + \alpha)$ in the next line but one.

In the last page I have also detected an error. The formula for the height of the middle point of a small elliptic arc above its chord is correct as there given. But I should not have left it in terms of λ, the amplitude, but of s, the length of the arc; as λ is not the same, whereas s is, in the three cases to which the formula is applied. This change will make the height above the chord

$$= \frac{s^2}{8a}\left\{1 + \epsilon\left(\frac{1}{2} + \frac{3}{2}\cos 2\mu\right)\right\} = 20\,(1 + 1.512\,\epsilon) \text{ miles, the same as}$$

before excepting the *sign* of ϵ.

The result of this is, that my arc is *flatter* by 157 feet in the sagitta and the arc when mountain attraction is neglected is *more curved* by 281 feet, than the mean curvature.

These corrections have no effect upon the results of my paper. It is possible that there may be other numerical errors, for when the paper was written I was away from all means of employing a computer, as is usual in such cases, to verify the long numerical calculations, not one-tenth of which appears in what is printed. I feel convinced, however, that there is no material error: for I used every precaution I could, and applied every test. The errors mentioned above

method; but to compare it with *other* arcs, and to see whether they are curved so as to belong to one and the same spheroid with mine. One arc he compares it with, runs westward from Kulianpur to Kurachi; the other is a prolongation of the great arc southward from Damargida to Punnœ (latitude 8° 9′ 32″). The only question, therefore, which he can solve is, whether his arcs and mine belong or not to one spheroid; not, whether my calculation is right or not. In fact, his process goes wholly upon the gratuitous hypothesis, that all arcs wherever measured belong to one and the same spheroid; that is, that every meridian is an ellipse, and all meridians the same ellipse, and that every arc of longitude is circular. It is a noticeable coincidence, and by no means unfavorable to my calculation, that he finds that the curvature of the arc from Damargida to Punnœ (the prolongation of my arc) coincides more nearly with my ellipse than with the average one. Further on, in his first paper, Mr. Tennant applies a third test, viz. the comparison of the computed and observed azimuth of Kalianpur and Kurachi. But the same objection applies to this also. In fact Mr. Tennant's calculations do not affect my arc; and simply because he has not examined that arc, nor gone through my calculations.

7. There are other indications that Mr. Tennant has mistaken the subject. For example (art. 13) "the attraction is so enormous, if Mr. Pratt's values hold good, near the mountains ...." But I particularly specify, and the whole line of reasoning shows, that my calculation does *not* apply to such places (see p. 66, note, of my paper): and in the continuation of the note in the next three pages I point out a method for such places in and near the mountains: so that the wish expressed by Mr. Tennant in par. 17 was met in

occur at the close, and not in any important place, at least important for my results, but in a kind of corollary.

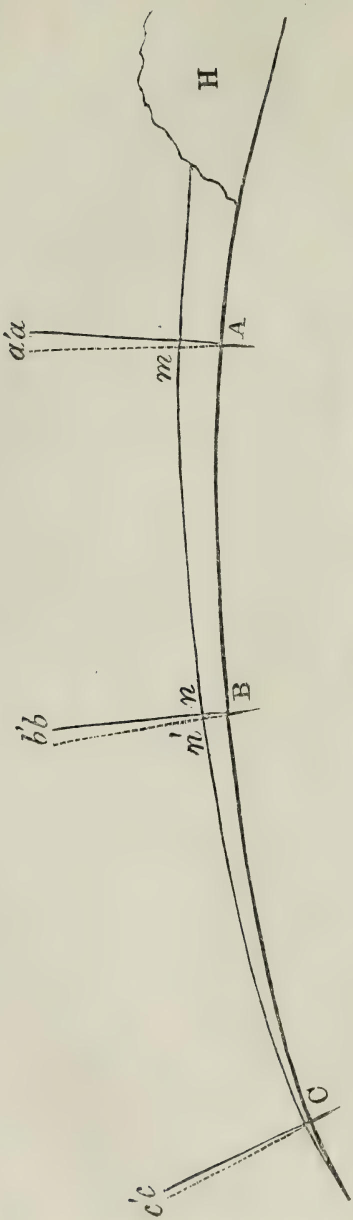
With reference to paragraph 3 of Mr. Tennant's second paper, I would here observe, that, in the application of the above formula, the three arcs are brought to chords in the same line and the sagittæ compared, merely as a piece of geometry, without any reference to the manner in which they lie and cut each other in the Problem of the Figure of the Earth. The object is simply to compare the degrees of bending between the two extremities, in the three cases, as indeed I state in the paper; and the result is given above.

the paper before him—"If an estimate of the attraction at Benog [in the mountains] could be made ...." Then in Mr. Tennant's second paper there are other expressions which show the same bias. He says "He [Mr. Pratt] has failed in satisfying the geodesical data of the great Longitudinal Series." But I did not make the attempt. Mr. Tennant must mean that on applying my results to the great longitudinal series, he failed to show that they tally, on the supposition that the earth's figure is a perfect spheroid. This is what I should have expected: and quite confirms my general view. He says further on, "It [the ellipticity I deduce for the great arc of 800 miles long] is useless for geodesical purposes." Of course it is, if the geodesical operations are carried on with an assumed, and most probably wrong, ellipticity. If the *mean* ellipticity be not the right one, then not *that* ellipticity, but some other, ought to be used in computing the latitudes of places in the neighbourhood of the arc, otherwise the geodesical operations of the Great Survey will be "useless" for the purpose of attaining to that accuracy which the survey is expected to attain. I need not quote other passages. I have read through both Mr. Tennant's papers and his interesting calculations with great care. They cannot disprove the results of my paper for the reason I have mentioned. The only way will be to point out *where* my calculations are wrong, or to show that some other cause is in operation which nullifies the mountain attraction. One other expression only I will notice, as it convinces me, that Mr. Tennant will never clear up the discrepancies while he takes his present view. He speaks of my "hypothetical attractions." Now the only *hypotheses* my calculation of the attraction goes upon are, (1) that the Himalaya Mountains exist, and (2) that each particle of them attracts according to the law of universal gravitation. The amount of this attraction is a matter of calculation; and to determine this was the primary object of my paper in the Philosophical Transactions. The calculation is there printed, and has been before the public for three years. It is impossible to ignore either the existence or the attraction of this enormous mass. It is possible to show that some other cause exists, to *counteract* this disturbing cause. It is also possible to show that the *amount* I have deduced is wrong; because I may

have made mistakes in the arithmetic, or the data regarding the heights of the different parts of the mass may be wrong. But *there* is the calculation, open to inspection, examination, and correction. I can only say, that when I arrived at my result (in 1854) I was very much disappointed that it did not tally with the Great Survey: and I tried every method (see articles 44 to 46 of my paper) to make it do so: but could not succeed. And even now, if no counteracting cause can be discovered to nullify the effect of attraction, I should be very glad, for the sake of saving trouble to the Survey operations, if the amount I arrive at could be shown to be wrong. But it must be, not by the application of tests based upon gratuitous assumptions, nor by any ulterior difficulties which the large amount of attraction may appear to lead to; but by an examination of the calculation itself, showing that the data of heights are so much out, or the arithmetical operations so far erroneous, as materially to affect the result.

8. One of Mr. Tennant's calculations in his second paper serves to show the necessity of calculating and allowing for mountain attraction. The diagram in the next page will illustrate this. $A\ B\ C$ is the actual arc of the meridian running through the three stations Kuliana, Kulianpur, and Damargida. Aa, Bb, Cc are the normals to this arc at those three places, and therefore the directions in which the plumb-line would hang were there no disturbing cause. A disturbing cause exists in the enormous mass H of the Himalayan mountains which attracts the bob of the plumb-line so as to make it hang in the lines $a'A$, $b'B$, $c'C$ making the angles of deflexion aAa', bBb', cCc'. These angles are smaller the further removed the station is from H. The spirit-level, the levelling of the astronomical instruments—every thing regulated by gravity—is affected by this disturbing cause. And the cause, owing to the enormous mass of attracting matter, has its influence, unlike other local and minor disturbing causes, along the whole line of the arc though in a diminishing degree. This the calculation shows.

If we were to proceed from C and move northwards, laying down a horizontal line by means of a spirit-level (as in laying down a base-line), we should find ourselves gradually rising above the arc CBA; we should be obliged to stilt up the spirit-level, till over B



Remarks.

ABC is the actual arc of the meridian.

A is Kuliana in lat. 29° 30′ 48″.

B is Kulianpur in lat. 24° 7′ 11″.

C is Damargida in lat. 18° 3′ 15″.

H is the mass of the Himalayas.

Aa, *Bb*, *Cc* are normals to the arc *ABC*, or the lines in which the plumb-line would hang if the Himalayas did not attract.

Aa′, *Bb′*, *Cc′* are the actual plumb-lines, inclined to the above, owing to attraction.

In my paper in the Philosophical Transactions of 1855, the following are the results of attraction

$\angle aAa' = 27''.853$, $\angle bBb' = 11''.968$ $\angle cCc' = 6''.909$.

Cnm is the curve drawn from Damargida which cuts all the actual plumb-lines at the stations on the arc at right angles.

it had attained the height $Bn = 99$ feet, and over A the height $Am = 271$ feet—these being the heights found by Mr. Tennant on using my formula of attraction. Cnm (and not CBA) is the curve along which the spirit-level would move, as this is the curve which cuts all the plumb-lines at right angles. In ordinary cases the curve which cuts the plumb-lines at all stations on the meridian at right angles is the curve of the arc. This would be the case in this instance also, were it not for H. If H did not exist, Cnm would coincide with CBA. Now if mountain-attraction is not taken account of, it is the same as supposing that H does not exist: in which case while the calculation of the Great Survey is being made in reality (because H *does* exist) for Cnm, the calculators imagine they are making it for CBA. They come to some station, B suppose, on the arc itself, having well calculated the distance from C; they apply the spirit-level, find that Bb' is the vertical, and think that CB is the arc they have calculated in fathoms, whereas it is Cn', that arc along the upper curve which comes to the same plumb-line. This arc is shorter than CB by nn'; and therefore by that quantity is B placed in the map too much north, in consequence of neglecting mountain-attraction. And this is an error wholly independent of the particular curvature of the meridian and therefore it affords an additional argument to show the necessity of calculating and allowing for deflexion.

9. Mr. Tennant's next calculation shows that the effect of even much smaller masses than the Himalayas may be of importance and may disturb the local form of the curve cutting the plumb-lines at right angles, which, as I have said, is the curve to which the Great Survey calculations refer. The derangements of the curve may be only local in this case; but if any one or more of the stations used for finding the astronomical amplitude be situated in these localities, the effect may be of serious importance. The effect of these comparatively small masses I have also shown in a paper on the English Arc printed in the Philosophical Transactions for 1856. This only aggravates the uncertainty caused by attraction, and increases the doubtfulness of results arrived at without a complete knowledge of the disturbing causes—at least as far as those results are supposed to have an extreme accuracy.

On the present position of the question of Himalayan Mountain-Attraction, as affecting the Great Trigonometrical Survey.

10. I will conclude this letter with some remarks on this subject. The average form of the earth has been already determined with so much precision, that the Great Trigonometrical Survey cannot be expected to improve it. The only new information it can communicate on this subject is, the extent to which the different parts of the Indian continent depart from this average spheroid. This is a matter of no peculiar interest in itself. Unless as a record for comparison in future ages it might be found of use; just as, at present, it would be a matter of interest to know the exact changes of level the surface has gone through in ages past, as these might serve to verify and to fix the chronology of those elevations and sub-mergings of extensive portions of the surface, the evidences of which geologists see in the fossil remains. This, however, is labouring for generations who may never exist.

The real importance of knowing the exact form of Indian arcs is seen in the effect which an erroneous determination of the curvature may have upon that accuracy in the Mapping of the Country which the Great Survey is supposed to ensure.

11. In calculating this curvature, it is absolutely necessary to determine and allow for the effect of mountain-attraction upon the plumb-line in all places where the latitude is observed astronomically. Without this, the curvature cannot be ascertained. I propose now to show this.

If the determinations in the Great Trigonometrical Survey are correct, they must satisfy this test, that the *computed* amplitude of every arc must be precisely equal to the *observed* amplitude. Colonel Everest's work published in 1847 shows that this test is not satisfied, for the great arc, Kaliana (29° 30′ 48″) to Kalianpur (24° 7′ 11″). His calculations show a discrepancy of 5″.236 in the upper portion. In this comparison there are TWO sources of error which it is necessary to examine—one, in the *computation* of the amplitude; the other, in the astronomical *observation* of the amplitude. For computing the amplitude of an elliptic arc, it is necessary to know (1) the length of the arc, (2) the lati-

tude of the middle point of the arc, and (3) the dimensions of the ellipse of which it is part. The first of these is determined with great accuracy by the survey, and is altogether unaffected by local or mountain-attraction (see pp. 54, 55 of my paper).* The second, which is not required to any great nicety, is readily found. The third is altogether *assumed*—and here is the first source of error. It has been *assumed* in the Great Trigonometrical Survey that the great arc belongs to an ellipse of which the curvature is that of the average spheroid of the earth. This is not only very far from being certain, but is most probably not the case, as I have shown in my preliminary remarks. Then in the determination of the amplitude by observation, all the elaborate instrumental observations and calculations of the latitudes of the three stations at the extremities and the middle of the arc in question (viz. at Kuliana, Damargida, and Kulianpur near the middle) described by Colonel Everest in his volume are thoroughly to be depended upon. But the instruments are fixed by the *plumb-line;* and therefore any error in this line caused by local or mountain-attraction vitiates the results. Here, then, is the second source of error. Were there only one source of error, the error might be determined by comparing the computed and observed amplitudes. But as this gives only one equation of condition and there are *two* sources of error—and this must be the case for *each* arc, so that no comparison of arcs will help us—we must determine one, at least, of the errors

* This may appear to be at variance with paragraph 8 above. But the cases are different. The fact is, that the correction there pointed out *is* after all practically made during the process of the survey; and in this way. Since B cannot be seen from C, being more than 400 miles off, intermediate stations are chosen for making observations and connecting B and C by a chain of triangles; and these intermediate stations are down upon the arc CB, and not on the arc Cn. Of course if the spirit-level were actually used all along, and the stilting process, which would then be necessary, were carried on, this would not be the case. But this course is *not* adopted in the survey; but, to make all the intermediate observations, they come down to the arc CB, and begin their curve like Cn, as it were, over again at each station; so that the height is not allowed to accumulate to Bn, and therefore the projected part of this line is not a correction which must be applied to the length of the arc, as this correction *is* practically made by the surveyors *piece-meal*, by making their observations from CB and not from Cn, as they do not adopt stilts.

in some other manner, and then determine the other by the comparison of the amplitudes. I can conceive of no means of finding the curvature of the arc by any independent method: but the other error, the effect of attraction, can be determined by direct calculation, though at first sight a hopeless and in the end a very laborious operation in the case of such a huge and irregular mass as the Himalaya mountains, and not practicable without some such expedient as that which I have called the "Law of Dissection" in the paper in the Philosophical Transactions.

12. The main results of the calculation of attraction in that paper are as follows:—

Deflexion of plumb-line in meridian at Kaliana = 27″.853.
Ditto at Kalianpur = 11″.968.
Ditto at Damargida = 6″.909.

By means of the property of a curve I find the law of meridional deflexion for all stations on this double arc *(but for no other places)* to be

$$\text{Meridional Deflexion} = \frac{114''.712}{L - l + 3.520}$$

l and L being the latitude, in degrees and parts of a degree, of the proposed station and of Kaliana, the north extremity of the arc. It is the application of these corrections to the astronomical observations, and then the comparison of this corrected astronomical amplitude with the computed amplitude (as described towards the close of para. 11) which brings out the corrected ellipticity $\frac{1}{426}$ for this arc, instead of $\frac{1}{300.8}$.

13. Mr. Airy in a paper in the Philosophical Transactions for 1855, (p. 101,) states that he was at first very much surprised at the large amount of the deflexion thus discovered. And he goes on to suggest a remedy. But he does not call in question the correctness of my result. He throws out the idea, that there is another cause in operation which counteracts the effect of the attraction; viz. a *deficiency* of attracting matter immediately beneath the mountain mass. Three objections were started to this hypothesis in the postscript to my second paper (on the English Arc), p. 51 of the Transactions for 1856. They are more fully discussed in the Philosophical Magazine for November 1855. No answer has been given

to these objections; and several competent judges have pronounced the hypothesis to be untenable: I therefore regard it as abandoned.

It is in this direction, however, I fully believe, that a counteracting cause is to be found, if there be any, to modify the large disturbing effect of the Himalaya Mountains. I have recently been considering this subject again, and purpose communicating a paper to the Royal Society on the subject shortly, if my hopes are verified by further examination. This cannot, however, diminish the importance of ascertaining the true amount of deflexion from mountain-attraction, as every disturbing cause should be fully examined and estimated.

14. The present position of the problem of Himalayan attraction is this. The data which I assume in the six tables in pages 78 to 83 of the Philosophical Transactions for 1855 should be examined, to see whether the values of h are tolerably correct representatives of the average heights of the masses standing on the several "compartments" to which they appertain. This the gentlemen of the survey can best do. I have written to Colonel Waugh, the Surveyor General, (who first called my attention to this subject) for corrections of these heights; but, having received no corrections, I conclude the data are rightly assumed.

I am, your obedient servant,

Calcutta, July 6th, 1858. J. H. PRATT.

Bháskará's knowledge of the Differential Calculus.—By BAPU DEVA SHASTRI, *Professor of Mathematics and Astronomy in the Government Sanskrit College, Benares.*

To the Editor of the Asiatic Society's Journal.

SIR,—It appears to be generally believed that the principle of the Differential Calculus was unknown to the ancient Hindu mathematicians. Allow me to correct this impression by the following statement regarding what Bháskaráchárya has written on the subject.

Bháskarácharya says that "the difference between the longitudes of a planet found at any time on a certain day and at the same time on the following day is called its rough motion during that interval of time; and that its *Tátkálika* motion is its exact motion."

The *Tátkálika* or instantaneous motion of a planet is the motion which it would have in a day, had its velocity at any given instant of time remained uniform. This is clear from the meaning of the term *Tátkálika* and it is plain enough to those who are acquainted with the principles of the Differential Calculus that this *Tátkálika* motion can be no other than the differential of the longitude of a planet. This *Tátkálika* motion is determined by Bháskarácharya in the following manner.

"Suppose, $x, x' =$ the mean longitudes of a planet on two successive days;

$y, y' =$ the mean anomalies;

$u, u' =$ the true longitudes and

$a =$ eccentricity or the sine of the greatest equation of the orbit.

Then, $x'-x =$ the mean motion of the planet, $y'-y =$ the motion of the mean anomaly and $u'-u =$ the true motion of the planet." Now according to Bháskarácharya, the equation of the orbit on the first day $= \dfrac{a. \sin y}{\text{Rad}}$, and

that on the next day $= \dfrac{a \sin y'}{\text{Rad}}$;

$$\therefore \quad u = x \pm \frac{a. \sin y}{\text{Rad}}, \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1).$$

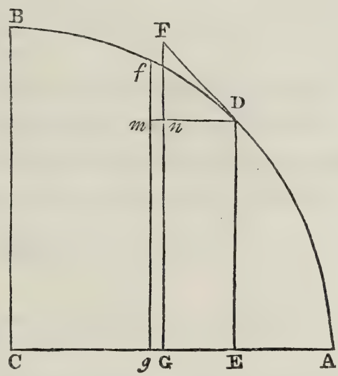
$$\text{and} \quad u' = x' \pm \frac{a. \sin y'}{\text{Rad}};$$

$$\therefore \quad u' - u = x' - x \pm \frac{a\,(\sin y' - \sin y)}{\text{Rad}} \quad \ldots\ldots \quad (2).$$

Now, in order to know the instantaneous value of $u'-u$, it is necessary first to know the instantaneous value of the *Bhogya-khanda* or the difference between two successive sines given in *Tables of sines*. Thus, suppose the sines of the arcs 0, A, $2A$, $3A$, &c. are given in the *Tables of sines*, then

sin A—sin 0, sin $2A$—sin A, sin $3A$—sin $2A$, &c. are the *Bhogya-khaṇḍas.*

"These are not equal to each other but gradually decrease, and consequently while the increase of the arc is uniform, the increment of the sine varies"—on account of the deflection of the arc. Hence the difference between any two successive sines is not the *Tátkálika Bhogya-khaṇḍa;* but if the arc instead of being deflected be increased in the direction of the tangent then the increase which would take place in the sine is the *Tátkálika Bhogya-khaṇḍa* i. e. the instantaneous motion of the sine.



Thus, in the accompanying diagram, suppose the arc $Df = A$, then, sin Af—sin $AD = fg - DE =$ fm, the *Bhogya-khanda* of the sine DE; but this is not the *Tátkálika Bhogya-khaṇḍa* of that sine. If the arc AD instead of being deflected towards f, be increased in the direction of the tangent, so that $DF = Df = A$; then $FG - DE = Fn$, which would be the *Tátkálika Bhogya-khaṇḍa* of the sine DE i. e. the instantaneous motion of that sine."

Bháskaráchárya has determined that "the *Tátkálika Bhogya-khaṇḍa* varies as the cosine of arc, i. e. when arc $= 0$, its cosine equals the radius, and $A =$ the *Tátkálika Bhogya-khaṇḍa.* And, as the arc increases, the cosine and the *Bhogya-khaṇḍa* decrease. Hence, if y be any given arc, the *Tátkálika Bhogya khaṇḍa* answering to it will be found by the following proportion.

As, R (or the cosine of an arc $= 0$.)

: The *Tátkálika Bhogya-khaṇḍa* ($= A$.)

: : Cosine y.

: *Tátkálika Bhogya-khaṇḍa* of sin y.

$\therefore$ *Tátkálika Bhogya-khaṇḍa* $= \dfrac{\text{A. cos } y.}{\text{R}}$."

The reason of the above proportion can be easily understood from the two similar triangles DCE and DFn in the above diagram.

"After having thus determined the *Tátkálika Bhogya-khánḍa*, the instantaneous value of $\sin y' - \sin y$ is found by the following proportion.

As $A : \dfrac{A.\cos y}{R} :: y' - y : \dfrac{\cos y \times (y' - y)}{R}$ (= the instantaneous value of $\sin y' - \sin y$.)

By substituting the instantaneous value of $\sin y' - \sin y$ in the equation (2), the instantaneous value of $u' - u$, the true motion of the planet will be found : that is,

$$u' - u = x' - x \pm \frac{a.\cos y}{R}.\frac{y' - y}{R} \quad \ldots\ldots \quad (3)$$

This is the instantaneous motion of the planet."

This is the way in which Bháskaráchárya determined the instantaneous motion of the sun and the moon.

Equation (3) is just the differential of equation (1). As,

$$d\,(u) = d\,(x \pm \frac{a.\sin y}{R.});$$

$$\text{or } du = d\,x \pm \frac{a}{R}.\frac{\cos y}{R}.\,dy;$$

which is similar to equation (3).

Now, the term *Tátkálika* applied by Bháskaráchárya to the velocity of a planet, and his method of determining it, correspond exactly to the differential of the longitude of a planet and the way for finding it. Hence it is plain that Bháskaráchárya was fully acquainted with the principle of the Differential Calculus. The subject, however, was only incidentally and briefly treated of by him; and his followers, not comprehending it fully, have hitherto neglected it entirely.

I have the honor to be,

Your obedient servant,

Bapu Deva Shastri,

4*th May*, 1858.

Of two Edicts bestowing Land, recorded on plates of copper.—*By* Fitz-Edward Hall, M. A.

The inscriptions here edited in the original Sanskrit, with translations and comments, add little to our previous knowledge of Indian history. The first, however, ascertains a regnal year of one of the kings of Kanoj; and it is now settled, beyond reasonable doubt, that Madanapála Deva was administering this principality in A. D. 1097. The patent which supplies this date is the oldest monument of the kind, emanating from the dynasty of its donor, that has yet been discovered.

The names of the sovereigns in question, and one or more of the years during which the last four of them are known to have borne rule, shall, first of all, be enumerated, on the authority of grants similar to those which are to follow.

1. Yas'ovigraha.*
2. Mahíchandra.

* Colebrooke calls this prince, S'rípála; but on insufficient authority. See Miscell. Essays, Vol. II., pp. 286 and 294.

A crude note on this point will be found in this Journal, for 1841, p. 98. Neither had Dr. Mill nor had any one else pretended—unless it was Colebrooke, and he only by his silence—the identity, other than ordinal, of S'rípála and Yas'ovigraha.

The writer of the note referred to was, further, unaware of Capt. Fell's remarks on Colebrooke, and likewise of Colebrooke's acknowledgment that he had confounded Vijayachandra with Jayachandra. Mr. Torrens also mistakes in naming the work, and the volume of it, from which he gives an extract.

In the Khaira inscription, which has been partially deciphered, first by Colebrooke, and afterwards by Mr. James Prinsep, occurs the name of King Yas'opála. See Miscell. Essays, Vol. II., pp. 277 and 278; and this Journal for 1836, p. 731. Capt. Fell asks: "Is he the same with Yas'ovigraha?" As. Res., Vol. XV., p. 453. To Prof. Wilson it "seems not improbable" that he was. Ibid., Vol. XV., p. 462. Dr. Mill thinks that the Vigraha of the Shekhávátí inscription is, very likely, the Yas'ovigraha of the Kanoj dynasty. Journal of the As. Soc. of Bengal, for 1835, pp. 369 and 392. These opinions, though they have not been proved erroneous, still await substantiation.

Another Vigraha has come to light since Dr. Mill wrote as above cited. His time, which was not long prior to 1042, might assist an hypothesis that he was

3. Chandra Deva.* A. D.
4. Madanapála Deva. 1097.†
5. Govindachandra Deva. 1120‡ and 1125.§ A. D.
6. Vijayachandra Deva. 1163.||
7. Jayachandra Deva. 1177, 1179,¶ and 1186. *

With Jayachandra, who died about 1193, his dynasty closes; at least so far as concerns Kanoj. But this prince, it should appear, left an heir, whose son, S'ivájí, only seventeen years after the death of his grandsire, attracts attention as the first Rájá of Jodhpur.† The father of S'ivájí, the only link required to connect him with Jayachandra, was S'wetáráya; if dependence may be placed on the pedigree‡ of the chiefs of Márwáḍ, here appended.

one with Yas'ovigraha. But it appears as if he died childless; and mention is wanting that he adopted an heir. Journal of the As. Soc. of Bengal, for 1841, pp. 668 seq.

If the Vigraha of the inscriptions at Old Delhi is the same with the Vísala whom they record, his era was as late as 1163; and he was contemporary with Vijayachandra of Kanoj.

* Prof. Wilson, on the latest occasion of his recapitulating the rulers of the family in discussion, inadvertently reduces them from seven to six, besides converting Mahíchandra into Mahípála. The individual omitted is Chandra Deva, the first person in his line, of any recognised importance. It was he that conquered Kanoj; and we have yet to learn that his ancestors, Yas'ovigraha and Mahíchandra, were persons of regal rank. See Ariana Antiqua, p. 435.

† See the first of the ensuing inscriptions.

‡ See the As. Res., Vol. XV., p. 447.

§ See the latter of the inscriptions in this paper.

|| See Colebrooke's Miscell. Essays, Vol. II., p. 286.

The Tárácháńdí inscription, which is dated in the *Samvat* year corresponding to A. D. 1172, refers to Vijayachandra by name and title. It is not clear, however, from this memorial, whether he, or his son, was reigning at that time. Most probably it was the son: and it is positive that it was he, if we may credit the Márwáḍ chronicles; as they place the death of Vijayachandra in 1168. See Colebrooke's Miscell. Essays, Vol. II., pp. 289, 295, and 296. Also Journal of the As. Soc. of Bengal, for 1834, pp. 341 and 342.

¶ For the first two dates see the As. Res., Vol. XV., pp. 446, 447, 450 and 460.

* See Journal of the As. Soc. of Bengal, for 1841, pp. 98, 100 and 103.

† In A. D. 1210. Useful Tables, Part the Second, p. 111; after Col. Tod.

‡ In eleven Sanskrit couplets; for a copy of which, as of his own composing,

S'weta-ráya.

1. S'iváji* Ráva, or S'ivají R.; father of
2. A'sthána Ráva, father of
3. Dhúḍaji, father of
4. Ráya-pála, father of
5. Jálaṉa,† father of
6. Tíḍojí.
7. Chháḍojí Ráva,‡ father of
8. Salashaṉa, or Salakshaṉa; father of
9. Víramjí, or Vírají; father of
10. Chúḍoji.
11. Ríḍa Malla,§ father of
12. Jodojí,|| or Yoddhájí; father of
13. Sújojí Ráva, father of
14. Vághojí,¶ or Vyághrají.
15. Gángojí Ráva, or Gángeya R.; father of
16. Mála Deva.*

I am indebted to a Bráhman who gave himself out to be the family-priest of the present Rájá of Jodhpur. This man I saw at Ajmere, about a year ago. The verses, at their conclusion, claim, for their author, one Dayaráma.

* Described as श्वेतरायकुले जातः । If S'iváji was grandson of Vijayachandra, and son of S'wetaráya, the word *kula* must be understood as implying paternity. S'weta-ráya little resembles a gentile appellative.

S'iváji is the reading of the original. I have annexed the more classical form; and so of many of the names in this catalogue. Relationship, where intimated in the Sanskrit, is also specified in the English.

† Mr. Prinsep interposes "Kanhul" between Ráyapála and Jálaṉa.

‡ "Chado" comes first, according to Mr. Prinsep; and then "Thedo." The original might be taken as designing these two names for one and the same person:

तीडोजी तत्सुतो ज्ञेयः छाडोजीरावसञ्ज्ञकः ।

§ The same sort of doubt as that expressed in the last note, here offers. The Sanskrit is:

चूडोजी तत्सुतो जात रीडमल्लेति सञ्ज्ञकः ।

|| The founder of Jodhpur: जोधपत्तनकारकः । The *Baghela-vans'a-charita* has Yodhapura.

¶ This name is omitted by Mr. Prinsep.

* Mánavati,—daughter of Malla-ráya, son of Mála Deva,—married Vírabhadra, prince royal of Boghelkhanḍ, in the *Samvat* year 1616, or A. D. 1559. See

17. Udai Sinha; or Udaya S.; father of
18. S'úra Sinha, father of
19. Gaja Sinha, father of
20. Jaswanta, or Yas'aswat, father of
21. Ajita Sinha,* father of
22. Bagat Sinha, or Ba*kh*t† S.; father of
23. Vijaya Sinha, father of
24. Gumána Sinha,‡ or Gumán S.; father of
25. Mána Sinha, father of
26. Tagat Sinha, or Ta*kh*t S.; now ruling.

The more ancient of the two inscriptions under notice was examined, by me, at Benares. It is, I believe, the property of Major R. R. W. Ellis. Of its history I know nothing. A copy is subjoined.

स्वस्ति ।

अकुण्ठोत्कण्ठवैकुण्ठकण्ठपीठलुठत्करः ।
संरम्भः सुरतारम्भे स श्रियः श्रेयसेऽस्तु वः ॥ १ ॥
आसीदशीतद्युतिवंशजातक्ष्मापालमालासु दिवं गतासु ।
साक्षाद् विवस्वानिव भूरिधाम्ना नाम्ना यशोविग्रह इत्युदारः ॥२॥
तत्सुतोऽभून् महीचन्द्रश्चन्द्रधामनिभं निजम् ।
येनाऽपारमकूपारपारे व्यापारितं यशः ॥ ३ ॥
तस्याऽभूत् तनयो नयैकरसिकः क्रान्तद्विषन्मण्डलो
विध्वस्तोद्धतवीरयोधतिमिरः श्रीचन्द्रदेवो नृपः ।
येनोदारतरप्रतापशमिताशेषप्रजोपद्रवं
श्रीमद्गाधिपुराधिराज्यमसमं दोर्विक्रमेणाऽर्जितम् ॥ ४ ॥

the *Baghela-vans'a-charita*, by Kankana, son of A's'áditya; 17th chapter, *s'l.* 62 and 63.

* Called 'a renowned exterminator in the utter destruction of Muhammadans:' यवनप्रलये ध्वंसकारकस्तु विशारदः ।

† Before Ba*kh*t Sinha's name, Mr. Prinsep inserts two princes, Abhaya Sinha and Ráma Sinha, whom our genealogist omits. The first, at least, as being a parricide, brought no credit to his family. Ba*kh*t Sinha is spoken of as "captor of the chief of the Kachchhapas:' कच्छपेन्द्रापहारकः ।

‡ Mr. Prinsep has Bhíma Sinha.

तीर्थानि काशिकुशिकोत्तरकोशलेन्द्र-
स्थानीयकानि परिपालयताऽभिगम्य ।
हेमात्मतुल्यमनिशं ददता द्विजेभ्यो
येनाऽङ्किता वसुमती शतशस्तुलाभिः ॥ ५ ॥
तस्याऽऽत्मजो मदनपाल इति क्षितीन्द्र-
चूडामणिर्विजयते निजगोत्रचन्द्रः ।
यस्याऽभिषेककलशोल्लसितैः पयोभिः
प्रक्षालितं कलिरजः सकलं धरित्र्याः ॥ ६ ॥
यस्याऽऽसीद् विजयप्रयाणसमये तुङ्गाचलोच्चैश्चलन्-
माद्यत्कुम्भिपदक्रमासमभरभ्रश्यन्महीमण्डले ।
चूडारत्नविभिन्नतालुगलितस्त्यानासृगुद्भासितः
शेषः पेषवशादिव क्षणमसौ क्रोडे निलीनाननः ॥ ७ ॥

सोऽयं समस्तराजचक्रसंसेवितचरणः परमभट्टारकमहाराजाधिराजपरमेश्वरपरममाहेश्वरनिजभुजोपार्जितश्रीकन्यकुब्जाधिपत्यश्रीचन्द्रदेवपादानुध्यातपरमभट्टारकमहाराजाधिराजपरमेश्वरपरममाहेश्वरश्रीमन्मदनपालदेवो विजयी वणेसरमौअपत्तलायामऊआमग्रामनिवासिनो निखिलजानपदानुपगतानपि च राजराज्ञीयुवराजमन्त्रिपुरोहितप्रतीहारसेनाधिपतिभाण्डागारिकाक्षपटलिकभिषङ्नैमित्तिकान्तःपुरिकदूतकरितुरगपत्तनाकरस्थानगोकुलाधिकारिपुरुषान् समाज्ञापयति बोधयत्यादिशति च ।

विदितमस्तु भवतां यथोपरिलिखितग्रामः सजलस्थलः सलोहलवणाकरः समधूकचूतवनवाटिकाविटपतृणयूतिगोचरपर्यन्तः सगर्तोषरः सोर्ध्वाधश्चतुराघाटविशुद्धः स्वसीमापर्यन्तश्चतुष्पञ्चाशदधिकशतैकादशसंवत्सरे माघे मासि शुक्लपक्षे तृतीयायां सोमदिने वाराणस्यामुत्तरायणसङ्क्रान्तौ अङ्कतः संवत् ११५४ माघसुदि ३ सोमे वाराणस्यां देवश्रीत्रिलोचनघट्टे गङ्गायां स्नात्वा श्रीमद्राजाधिराजश्रीचन्द्रदेवेन विधिवन् मन्त्रदेवमुनिमनुजभूतपितृगणांस्तर्पयित्वा तिमिरपटलपाटनपटुमहसमुष्णरोचिषमुपस्थायौषधिपतिशकलशेखरं समभ्यर्च्य त्रिभुवनत्रातुर्वासुदेवस्य पूजां विधाय प्रचुरपायसेन हविषा हविर्भुजं हुत्वा मातापित्रोरात्मनश्च पुण्ययशोभिवृद्धये कौशिकगोत्राय विश्वामित्रौदलदेवरातत्रिप्रवराय छन्दोगशाखिने ब्रा-

ह्मणदेवस्वामिपौत्राय ब्राह्मणश्रीवाराहस्वामिपुत्राय ब्राह्मणश्रीवा-
मनस्वामिशर्मणे गोकर्णकुशलतापूतकरतलोदकपूर्वमापद्मसद्मनो हूह-
कान्तं यावत् शासनीकृत्य प्रदत्त इति ज्ञात्वाऽस्माभिः पितृदानशा-
सनप्रकाशनार्थं निजनामाङ्कितमुद्रया ताम्रपट्टके निधाय प्रदत्तो मत्वा
यथादीयमानभागभोगकरहिरण्यप्रभृतिसमस्तादायानाज्ञाविधेयीभूय
दास्यथ।

भवन्ति चाऽत्र श्लोकाः।

भूमिं यः प्रतिगृह्णाति यश्च भूमिं प्रयच्छति।
उभौ तौ पुण्यकर्माणौ नियतं स्वर्गगामिनौ॥ १॥
शङ्खं भद्रासनं छत्रं वराश्ववरवारणाः।
भूमिदानस्य चिह्नानि फलमेतत् पुरन्दर॥ २॥
सर्वानेतान् भाविनः पार्थिवेन्द्रान्
भूयो भूयो याचते रामभद्रः।
सामान्योऽयं धर्मसेतुर्नृपाणां
काले काले पालनीयो भवद्भिः॥ ३॥
बहुभिर्वसुधा भुक्ता राजभिः सगरादिभिः।
यस्य यस्य यदा भूमिस्तस्य तस्य तदा फलम्॥ ४॥
सुवर्णमेकं गामेकां भूमेरप्येकमङ्गुलम्।
हरन् नरकमाप्नोति यावदाभूतसम्प्लवम्॥ ५॥
स्वदत्तां परदत्तां वा यो हरेत वसुन्धराम्।
स विष्ठायां कृमिर्भूत्वा पितृभिः सह मज्जति॥ ६॥
षष्टिं वर्षसहस्राणि स्वर्गे वसति भूमिदः।
आच्छेत्ता चानुमन्ता च तान्येव नरकं वसेत्॥ ७॥
यानीह दत्तानि पुरा नरेन्द्रैर्
दानानि धर्मार्थयशस्कराणि।
निर्माल्यवान्तप्रतिमानि तानि
को नाम साधुः पुनराददीत॥ ८॥
वाताभ्रविभ्रममिदं वसुधाधिपत्यम्
आपातमात्रमधुरा विषयोपभोगाः।
प्राणास्तृणाग्रजलबिन्दुसमा नराणां

धर्मः सखा परमहो परलोकयाने ॥ ९ ॥
श्रीमन्मदनदेवेन पितृदानप्रकाशकः ।
शासनस्य निबन्धोऽयं कारितः स्वीयमुद्रया ॥ १० ॥
लिखितं करणिकठक्कुरश्रीसहदेवेन । शिवमस्तु । मङ्गलं महाश्रीः ।
श्रीमदनपालदेवेन ॥

TRANSLATION.

Well be it!

1. May yours, to *your* prosperity, be that transport which was S'rí's,* when, in the course of dalliance, her hands wandered over their support, the neck of Vaikuṇṭha, whose desire was *as yet* unsated.

2. The lines of monarchs† sprung from the solar race‡ having attained the celestial abode, there was born *one* Yas'ovigraha, by name; munificent, *and* manifestly comparable with the sun for plenitude of effulgence.

3. His son was Mahíchandra; whose illimitable fame, resembling the lustre of the moon, was spread, by him, beyond the sea.

4. His son was the auspicious king Chandra Deva,§ whose do-

* S'rí, or Lakshmi, personified abundance, or prosperity, is the wife of Vishṇu, here called Vaikuṇṭha.

† The equivocal import of the word rájan and its synonymes, which denote any member of the military class, as well as 'king,' has, doubtless, often stood in good stead to successful Kshatriya adventurers, when commemorating their ancestry, in making it appear as if actual royalty had subsisted in their families as a long-standing heritage. That Yas'ovigraha and Mahíchandra were nothing more than ordinary subjects, is by no means improbable, as has been intimated above.

‡ The word for 'sun,' embodied in the expression here rendered 'solar race,' is, in the original, represented epithetically by a compound signifying 'the not cold-rayed.'

The solar race comprises the first grand division of the martial class.

The translation of Jayachandra's grant, contained in this Journal for 1841, p. 101, &c., is crowded with errors of the grossest ignorance or heedlessness. The general character of the thing may be inferred from its distortion of the stanza to which this note is appended. It runs as follows:—"The Rájás who were descended from the lunar line having departed for heaven, one, named Yas'ovigraha, by his natural spirits was as the sun himself."

§ Colebrooke and Capt. Fell write S'ríchandra Deva. But it seems preferable to regard the syllable *s'rí* as an honorary prefix. See Miscell. Essays, Vol. II., p. 286; and As. Res., Vol. XV., p. 449.

minant passion was polity; discomfiter of the bands of his foes; dissipating the gloom *produced by the hostile presence of* haughty valorous warriors; *and* through whose most august grandeur was assuaged every hardship of the denizens of the unrivalled realm of Gádhipura* the famous, *which he had* acquired by the might of his arm:

5. Who, having repaired, as a protector to the religious resorts at Kás′í,† Kus′ika,‡ North Kos′ala,§ and Indrasthána,|| in bestowing, time after time, his weight in gold¶ on the twice-

* Gádhipura is the same as Kanyakubja, as will be seen hereafter.

† Kás′í generally intends the city of Benares; but it also designated the neighbouring country. There is ground to believe that, at one time, while this name was more particularly applied to the capital, Váráṇasí was employed, perhaps exclusively, to distinguish the province. See this Journal, for 1848, Part I., p. 71.

But a custom, the reverse of this, seems to have obtained, at a certain period. See the *Kalpa-druma-kaliká*, by Lakshmí Vallabha, *ad finem.* This work is a commentary on the *Kalpa-sútra* of the Jainas.

The word *váráṇasí*, said to occur in the *Atharva-veda*, is explained in the *Jábála Upanishad*, to be the same with the *sushumṇa*, or coronal artery; and *varaṇa* and *así* are named in defiance of grammar, as its constituents. The first of these is there asserted to be a synonyme of *pingalá;* the second, of *iḍá;* two tubular vessels, according to the reveries of the Yoga.

In the *Kás′í-khaṇḍa*, which rejects this derivation, it is insisted that the *Atharva-veda* means Benares; its Sanskrit form being analysed into the names of the two streams which skirt the city near its eastern and western extremities.

‡ Of Kus′ika it has been stated that it signifies the river Kaus′akí—*recte*, Kaus′ikí. See As. Res., Vol. XV., p. 454. But this is very questionable. A place near some sacred stream is probably here meant, rather than the stream itself.

§ North Kos′ala is supposed to be the old denomination for the vicinity of Ayodhyá. See the Translation of the *Vishṇu-puráṇa*, p. 190, foot-note 79; and Lassen's Indische Alterthumskunde, Vol. I., pp. 128 and 129.

|| Indrasthána, it is obvious to surmise, is another name for Indraprastha, or ancient Delhi.

¶ According to the *Matsya-puráṇa*, he who gives away his weight in gold will abide in the heaven of Indra during the periods of all the Manus. Afterwards he reaches the city of Vishṇu; and, when his hoard of merit is exhausted, he is born a universal monarch on earth. The *Agni-puráṇa* adds that, in his renewed human condition he will be free from all disease.

Fitting objects to be given away in quantities equal to one's weight are, any of the metals, precious stones, several sorts of grain, various fruits, betel, saccharine

born,* indented the earth, with his scales, on hundreds of occasions.

6. His son, Madanapála, the crest-jewel of princes, the ornament† of his family,‡ *now* bears sway; at whose consecration, by the water that glittered *as it was poured*§ from the *sacred* vessels, the dust *of sin* of the world, *contracted* from the iron age, was wholly washed away:

7. At the time of whose going forth to conquest, as the orb of the earth yielded beneath *even* the light pressure of the foot-falls of his careering elephants, impassioned, *and* high as lofty mountains, *the serpent* S'esha, gorgeous with the clotted gore that trickled from his palate, cloven by his head-gem|| *which had been driven into it,* as it were, in consequence¶ of being crushed, hid his face for a moment in his bosom.

substances, honey, milk, curds, clarified butter, oil, salt, and sandal-wood. Particular benefits are promised to each species of such donation. The recipients of the presents are Bráhmans: but they must subsequently perform expiation.

Minute instructions are laid down for preparing the balance, and the consecrated ground on which it is set up. A lucky day must be chosen for the ceremony. The donor is poised against his gift for as long a time as it requires to milk a cow; contemplating Lakshmí the while. Numerous gods and sages, together with the manes, are hallowed on the occasion. The deity presiding over the scales is Vásuki.

The above is selected from the *Dána-chandriká,* by Divákara Bhaṭṭa, surnamed Kále; son of Mahádeva Bhaṭṭa, son of Rámes'a Bhaṭṭa.

The practice of bestowing one's weight in various substances is now and then observed, to this day. But, when metals are selected as the gift, they are rarely other than of the baser sort.

* Anciently, persons of the first three classes; but, for many ages past, understood in the restricted acceptation of Bráhmans. The regeneration is effected by investiture with the sacred cord.

† Literally, 'the moon.'

‡ In the Sanskrit, *gotra.* A note on this word is given below.

§ Aspersion with water and other liquids plays a conspicuous part in the installation of a Hindu king.

|| In the Indian mythology, S'esha supports the centre of the earth on one of his thousand heads.

Hindu superstition assigns a precious stone to the head of every member of the serpent tribe.

¶ The original is *vas'át* 'by force.' As, however, the verb *pesh* means 'to

The same:—whose feet are justly revered by the entire brotherhood of potentates: son and successor* of the auspicious Chandra Deva, supreme sovereign, great king, chief ruler, lord paramount, emperor;† who gained, with his own arm, the primacy of happy

crush,' 'to grind,' and not simply 'to press down,' the conjectural reading *bhayát* 'for fear' would yield a better sense: 'in the apprehension of being,' &c.

* *Pádánudhyáta.* Professor Wilson—Journal of the Royal Asiatic Society, Vol. II., p. 393—errs in supposing that this formula may connect the names of contemporary rulers, sovereign and subordinate, to imply the inferiority of the latter. In the following volume of the same Journal, at p. 379, he remarks, on this expression, that it "is nothing more than a paraphrastic phrase for 'successor.' It means, literally, 'meditating upon his—the father's—feet;' denoting either the disposition of the son to imitate the paternal example, or to refer, with reverence, to the memory of his sire." Colebrooke, long before,—Transactions of the Royal Asiatic Society, Vol. I., p. 236: or Miscell. Essays, Vol. II., p. 303,—had, however, written as follows: "*Pádánudhyáta*, an ordinary periphrasis for son and successor: literally, 'whose feet are meditated, i. e. revered, by ....'" In some cases,—as in this Journal for 1839, p. 491,—the same words are used, by a chieftain, of his favourite divinity.

For this locution, *pádánta-khyáta* has sometimes been substituted, in decipherments of inscriptions. See our Journal for 1848, Part I., p. 71; and for 1851, p. 676. This epithet would signify, if anything, 'whose toes are notorious.'

In this Journal for 1855, p. 487, the Sanskrit may be found of a short inscription which I translated from a version taken by an archæologist of established repute, Mr. Edward Thomas, from an obscure copy of what I now know to be a very rough original. In the second line, as printed, is the phrase *pádánudhyátasya;* which is, of course, the correct reading for Major Cunningham's utterly meaningless *pádánadátasya.* See Bhilsa Topes, p. 151.

But I here mention this record chiefly with a view to express the opinion that it requires further examination before we can be positive about its contents. Four independent transcripts which I have lately had taken of it, have only served to increase bewilderment; with the exception of determining that आषाढमासे stands in place of श्रावणमासे.

† *Parama-bhaṭṭáraka, mahá-rája, adhi-rája, parames'wara, parama-máhes'wara:* and, if regard be had to their etymology, these appellations are not classed by subordination; for, to all appearance, the first and the last are indicative of co-ordinate eminence. The precise sense of *parama-máhes'wara* is 'supreme great lord.' In all cases, however, where *bhaṭṭáraka*, qualified, or unqualified, is met with in a list of this description, it stands at the head. Colebrooke says that it "answers to the title of majesty." Miscell. Essays, Vol. II., p. 303.

The *Aitareya-bhrámaṇa*, in its concluding pentad, has a curious classification of

the various species of earthly rulers imagined to have derived their styles from the attributes invoked on Indra, at his consecration as king of the gods. The ensuing extract will suffice for the present purpose :

स एतेन महाभिषेकेणाभिषिक्त इन्द्रः सर्वाजितीरजयत् सर्वान् लोकानविन्दत्। सर्वेषां देवानां श्रैष्ठ्यमतिष्ठां परमतामगच्छत्। साम्राज्य भौज्यं स्वाराज्यं वैराज्यं पारमेष्ठ्यं राज्यं माहाराज्यमाधिपत्यं जित्वाऽस्मिन् लोके स्वयम्भूः स्वराल*मृतोऽमुष्मिन् स्वर्गे लोके सर्वान् कामानाप्त्वाऽमृतः समभवत् समभवत्।

8th *panchiká*, 3rd *adhyáya*, *ad finem.*

" *Thus* consecrated by that great inauguration, Indra subdued all conquerable *earths*, and won all worlds. He obtained over all the gods, supremacy, transcendent rank, and pre-eminence. Conquering, in this world *below*, equitable domination *(sámrájya)*, happiness *(bhaujya)*, sole dominion *(swárájya)*, separate authority *(vairájya)*, attainment of the supreme abode *(párameshṭhya)*, sovereignty *(rájya)*, mighty power *(máhárájya)*, and superior rule *(ádhipatya)* ; *becoming a* self-existent *being* and independent ruler *(swarál)*, exempt from *early* dissolution ; and reaching all *his* wishes in that celestial world ; he became immortal : he became immortal." Miscell. Essays, Vol. I., p. 39.

This translation is Colebrooke's ; with several terms of the original interpolated, and here and there a new word marked, as being surplus to the rigid letter of the text.

The various denomination of chiefs—included under the sway of Indra, the *Ekarál*, or 'peerless lord'—intimated by the technicalities in this passage, are called, in the context, *Samrál*, *Bhoja*, *Swarál*, *Virál*, *Parameshṭhin*, and *Rájá ;* of which the first, third, and fourth are known, in more modern language, and with a notable change of character, as *Samráṭ*, *Swaráṭ*, and *Viráṭ*. See the Translation of the *Vishṇu-puráṇa*, p. 93 and its 3rd foot note.

Of the possessors of *máhárájya* and *ádhipatya* no special powers, entitled *Mahárája* and *Adhipati*, are appropriated to certain quarters ; as the *Samrál* princes, for instance, are allotted to the North.

An extensive scope of jurisdiction is assigned to the *Rájás :*

अथैनमस्यां ध्रुवायां मध्यमायां प्रतिष्ठायां दिशि साध्याश्चाऽऽप्त्याश्च देवाः षड्भिश्चैव पञ्चविंशैरहोभिरभ्यषिञ्चन्नेतेन च तृचेनैतेन यजुषैताभिश्च व्याहृतिभीराज्याय। तस्मादस्यां ध्रुवायां मध्यमायां प्रतिष्ठायां दिशि ये के च कुरुपञ्चालानां राजानः सवशोशीनराणां राज्यायैव तेऽभिषिच्यन्ते राजेत्येनानभिषिक्तानाचक्षते ।

Aitareya-bráhmaṇa, ubi supra.

" Next, the divine *Sádhyas* and *A'ptyas* consecrated him, *Indra*, in this middle, central, and present region, with the same *prayers from the* Rik and Yajush, and with the same holy words *as before mentioned*, in thirty-one days, for local dominion *(rájya)*. Therefore the several kings of the Kurus and Panchálas, as well as of the Vas'as and Us'ínaras, in this middle, central, and present region, are con-

* The Vaidik ळ.

Kanyakubja:*—the fortunate Madanapála Deva, supreme sovereign, great king, chief ruler, lord paramount, emperor; victorious; commands, acquaints, and enjoins the inhabitants of the village of Ahuám, in the canton† of Vaṇesar-Maua;‡ and all *his* people; and likewise sojourners from abroad; as also kings, queens, princes consort,§ *imperial* counsellors, chaplains *royal*, warders of the gate, commanders of troops, stewards, justiciaries,|| physicians, diviners,

secrated to sovereignty *(rájya)*; and *people* entitle those consecrated *princes*, *Rájá*."

This, too, is Colebrooke's translation, with a few changes, and such supplementation as is needed to make it intelligible in a detached quotation. Miscell. Essays, Vol. I., pp. 38, 39.

For the origin and exact signification of most of the expressions of dignity, found in our inscription, it may be that recourse must be had to records of the heroic or of the Pauráṇika period.

* The spelling of this name is observable; and it is the same in both these grants. Very little dependence can be placed, here, or in other instances, on the transcription of Jayachandra's grant in this Journal for 1841, pp. 98, &c.: else it might be cited for the more common, but anomalous form, Kányakubja; which is, regularly, an adjective. Kanyákubja is found still oftener; and the *Dwirúpakos'a* has a fourth variety, Kányákubja.

† *Pattalá*, in the Sanskrit. That this word corresponds to 'canton,' *mahal*, or *pargana*, will appear from another inscription, which I am preparing for publication.

‡ That is, I suppose, Vaṇesar near Maua; there being some second Vaṇesar, with which the present might be confounded. This mode of coupling the names of localities is still of very frequent occurrence in India, where, also as in other countries, a tract of territory is frequently denominated from its principal town.

Or *Maua* may be an affix, an old word whose sense is lost; unless it be the same as *mahúa*, from the Sanskrit *madhu*, or *madhuka*, the bassia latifolia.

Mau and *mahu* terminate many names of places, besides being found alone. Possibly they and *maua* are one vocable, under various forms. May it have meant 'village?'

§ *Yuvarája*, or "designated successor and associate in the empire." Colebrooke's Miscell. Essays, Vol. II., p. 286. "Young king, or Cæsar." Select Specimen of the Theatre of the Hindus, Vol. I., p. 280: 2nd ed. "Prince regent, or Cæsar." Ariana Antiqua, p. 265. "Vice-regent." Dr. Stevenson's *Kalpa-sútra*, p. 60. But the last definition is untenable. The *yuva-rája* is not succedaneous, but a coadjutor.

|| *Akshapaṭalika*; he who has cognizance of the *paṭala* 'litigation' of *aksha* 'judicial cases.' Or does *paṭala* mean 'filing?'

officers of gynecia, envoys, and persons who are proprietors of elephants, of horses, of towns, of mines,* and of herds of kine.†

Be it known to you: whereas: after ablution in the Ganges, at the landing of the divine and blessed Trilochana, at Váránasí;‡ on Monday, the third *day* of the light semi-lunation, in the month of *Mágha*, the sun having entered its northern path,§ in the year eleven hundred and fifty-four; *or*, expressed in numerals, on Monday, the 3rd *day* of the bright fortnight|| in *Mágha*, in 1154 *of the Samvat era*, at Váráṇasí: the village designated above; with its water and soil, with its iron-mines and salt-pits, with and includ-

* *A'kara-sthána;* literally, 'the site of a mine.'

† Some of these terms have, as yet, no place in our dictionaries; and several of them are, most probably, peculiar to the Sanskrit of the age in which the dynasty flourished to which the present patent appertains. For most of them, or of their synonymes, see the As. Res., Vol. XV., pp. 21 and 45; Transactions of the Royal Asiatic Society, Vol. I., pp. 174 and 175; and this Journal, for 1839, p. 486. A number of them, ill-explained, occur in the same Journal, for 1841, p. 103.

‡ The quay of Trilochana, 'the Three-eyed,' or S'iva, still maintain its reputation for sanctity, at Váráṇasí, or Benares.

§ उत्तरायण; corrected from उत्तरानयन of the copper plate; most of the minor errors of which I have rectified without directing attention to them. Among these is the constant substitution of the dental sibilant for the palatal. One or two omissions of uniting concurrent vowels, disallowed by a severe conformity to the requirements of grammar, have been retained for sake of clearness.

|| Instead of शुदि, we often, and perhaps oftener, find सुदि; as in the text. The *U'shma-viveka* has both forms. Though no other sober etymology of the word can readily be suggested, yet Dr. Mill's derivation of it, by abbreviation from शुक्लपक्षदिने should, therefore, be regarded with distrust. See Journal of the As. Soc. of Bengal, for 1835, p. 397. The Pandits look upon it as a word adopted into the Sanskrit from the vernacular languages. The *S'abda-kalpa-druma*, which has सुदि, is silent concerning its origin, and would restrict its use to 'the western country:' पश्चिमदेशे प्रसिद्धः p. 6195. The corresponding term, वदि, is omitted by the *S'abda-kalpa-druma;* and for a reason which not unfrequently has weight with this Encyclopædia. It is not in the Dictionary of Prof. Wilson.

Modern grammarians, fancifully enough, refer सुदि to सु or सुष्ठु and दान or ददाति, as importing the fortnight in which one 'appropriately presents' offerings to the gods. In like manner they would derive वदि from अवद्यति, after aphaeresis, as denoting the half-month during which a Hindu 'devotes oblations' to his ancestral manes.

ing* its groves of *madhúkas*† and mango-trees, its orchards,‡ timber,§ grass, and pasture,|| with its holes and saline wastes, with *everything* above and below, its four abuttals being ascertained, as far as its borders: *which had been* granted by patent, in perpetuity,¶—by the illustrious king and chief ruler,* the fortunate Chandra

* The tautology, in the original, of *sa* and *paryanta* ' with and including' seems to be a speciality of legal documents.

† The *madhúka* is a sort of bassia, from the blossoms of which a spirituous beverage, called *mádhwí*, is extracted by distillation. By the laws of the Mánavas—XI., 95—the drinking of this liquor is forbidden to Bráhmans.

‡ The Sanskrit scholar will observe that it would have been permissible, if not even preferable, to connect the word rendered ' groves' with *mudhúkas*, and that translated ' orchards' with ' mango-trees ;' especially if the last are coarsely described by the substantive *vana*. On the interpretation thus suggested, the writer will have affected the verbal collocation technically known, in the writings of the Sanskrit grammarians and rhetoricians, as *yathá-sankhya*, or " construction by the correspondent order of terms ;" a figure of speech exemplified in this couplet:

" Hæc domus odit, amat, punit, conservat, honorat,
Nequitiam, pacem, crimina, jura, probos."

Verses distinguished by the style of regimen here illustrated, are said to have been once called, by the French, " rapportez." See Notes and Queries, Vol. VII., p. 167.

§ *Viṭapa ;* trees in request for their wood, in distinction from those valued on account of their fruit or flowers. So say the native vocabularies.

|| *Triṇa-yúti-gochara*. These words, for ' grass and pasture,' are met with in an inscription translated by Colebrooke. He misreads them, however, *triṇa-dyatiyochara*. Miscell. Essays, Vol. II., p. 310. *Triṇa-yúti*, corrupted to *triṇayuthi*, has been taken for the name of a place, in this Journal for 1841, p. 103.

¶ The original, *ápadmasadmano húhúkántam yávat s'ásaníkṛitya*, is, a hundred to one, corrupt. Unable, however, to heal it by any convincing emendation, and content with a make-shift rendering, I avail myself of the fallacious ingenuity of a native scholar, to extract sense from it as it stands; more especially as the copper-plate pretty distinctly bears the phrase *húhúkántam*, in which lies all the difficulty. The ending—*kálam* was expected, whatever went before.

Divers pandits have assured me that *húhúka* is a name of the dog, derived from the animal's cry, *húhú ;* but no instance of the employment of this word has been produced. In one of the standard Sanskrit works on omens, that of Vasantarája, the nearest word to *húhú* is *hohá;* and this is explained as being imitative of the scream of the jackal.

Assuming *húhú* to be as the pandits assert by the adjective of *ka*, from the

Deva; *he* having satisfied,† in due form, the divinities of the Vedas,‡ the saints, *deceased* mortals, malignant spirits, and *his own* group of progenitors; paying homage to the sun,§ of brilliance potent in penetrating the regions of darkness; worshipping him, on whose brow is a segment of the moon;|| adoring Vásudeva,¶ the preserver of the triple universe; offering to fire* an oblation of abundant rice, milk, and sugar;† in order to enhance the merit and celebrity of his mother, of his father, and of himself; having taken

verb *kai*, we get *húhúka* 'that which utters the sound *húhú*.' *Húhúkánta* may, then, stand for 'dog-killer;' a possible equivalent of *s'wa-pach* 'dog-cooker,' the name of a tribe of pariahs.

Consonantly to these premises, the English of the clause is as follows: 'Apprizing all *rational beings*, from Brahmá to the outcast.' Brahmá is called 'the lotus-tenemented,' with allusion to the medium through which he originated from Náráyaṇa.

Th purport which, on the exposition here set forth, has been attached to the verb *s'ás*, is, to be sure, countenanced by the dictionaries. Yet there is no question that, in a land-grant, the odds are overwhelmingly against the use of *s'ás* otherwise than to express 'by patent;' above all, in such a form as *s'ásanikṛitya*; and considering that the present instrument contains no declaration, if it be not this, to show by what species of document the land was alienated.

The point thus discussed will be definitively cleared up, should another of Madanapála's grants or re-grants happen to be discovered. The formula in dispute would, doubtless, turn out to be one of duration. It was exchanged for another, by Madanapála's immediate successor, Govindachandra. See the next inscription.

* *Rájádhirája*, 'king and chief ruler.' Colebrooke represents these epithets by "conspicuous monarch." Miscell. Essays, Vol. II., p. 258.

† By drink-offerings.

‡ Or gods propounded in the litanies of the Vedas.

§ *Ushṇa-rochisha*; literally, 'of warm lustre.' Compare the third note above.

|| The divinity thus characterised is S'iva. 'Moon' is here expressed by an epithet: 'the regent of deciduous vegetation.'

¶ Vishṇu incarnate as Kṛishṇa.

* Here, and in many other inscriptions, in similar circumstances, the accusative is inaccurately put for the locative. We should read हविर्भुजि, not हविर्भुजं. So Colebrooke—Miscell. Essays, Vol. II., p. 300—has edited हिरण्यरेतसं for हिरण्यरेतसि.

† The composition formed of these three ingredients, is called, in the Sanskrit, *páyasa*.

water in his palm, purified by *incurving it into the form of* a cow's ear, and by *kus'a* grass;* to the Bráhman, the auspicious Vámana Swámi S'arman; son of the Bráhman, the auspicious Váráha Swámin, *and* grandson of the Bráhman, Deva Swámin; sprung from the stock of Kus'ika, and from three branches,† *those of* Vis'wámitra, Audala, and Devaráta; *and* of the Chhandoga division *of the Vedas* :‡ has, by us, cognizant of this *transaction, and* with intent to

* Of the correctness of this rendering I am not quite positive. *Gokarṇa* signifies, primarily, 'a cow's ear;' and, secondarily, 'the length of a cow's ear, or a long span,' and 'an auspicious inflexure of the hand into the form of a cow's ear.' For the last, and least usual acceptation, an authority occurs in the following couplet, which is adduced anonymously in the *A'chára-mayúkha* :

उद्धृत्य दक्षिणे हस्ते जलं गोकर्णवत्कृते ।
निश्वासनासिकाग्रे तु पाप्मानं पुरुषं स्मरेत् ॥

To continue; while *kus'a-latá* perhaps intends 'sacrificial grass' simply, it may mean 'the grass called *kus'a* and that known by the name of *latá*.' But the latter is not, to my knowledge, made use of for religious purposes: neither, by any forthcoming warrant, is *kus'a* comprehended under the class of *latá*, or 'creepers;' nor is *latá* a generic term for 'grass,' though it does import grass of a certain species, the panicum dactylon.

† 'Stock' and 'branch' but vaguely answer to the original words, *gotra* and *pravara*; of which Colebrooke says that the first expresses "descent from an ancient sage—*ṛishi*—, whence the family name is derived;" and that the second indicates "lineage traced to more of the ancient sages." The same venerable authority adds that "the distinction between *gotra* and *pravara* is not very clear." Miscell. Essays, Vol. II., p. 305. See also, Digest of Hindu Law, &c., Vol. III., p. 327, foot-note: 8vo. ed.

Prof. Wilson, in his Glossary of Indian Terms, affords no additional aid whatever towards defining these expressions. Nay; he does not even lead one to infer that any the slightest difficulty was ever experienced in discriminating them. The most that is known as to the difference between them is, that the *gotra* is primitive, and that the *pravara* is somehow derivative from it.

Sir H. M. Elliot justly observes that "it has become the custom to call all subdivisions of tribes, *gotes*, or gotras." Supplement to the Glossary of Indian Terms, Vol. I., p. 351.

In all cases where the family antecedents of a Bráhman are unknown, he is presumed to belong to the *gotra* of Kas'yapa, and the White *Yajur-veda* is adjudged to him for his portion of scripture.

‡ This is the *Sáma-veda*.

publish our father's deed of gift, been assigned *anew; we* recording *the grant* on a plate of copper, accompanied by a seal* engraven with our name.†

Bearing *this* in mind, *and* observant of *our* injunctions, you will pay all dues, as they fall to be discharged; namely, share of produce,‡ imposts, money-rent, and the rest.

The *annexed* stanzas§ are here *appropriate:*

* This seal has, for legend, the words श्रीमद्दनपालदेवः 'The auspicious Madanapála Deva.' The addition *deva* 'divine' is generally affixed to the name of a Hindu king, to mark his rank.

The figure of a conch is incised, by way of device, beneath the name in question, which is surmounted by a sketch of Garuḍa.

† Portentous as is the length of this period, it is surpassed in the original. Considering, however, that we are dealing with a formal deed of transfer, it is neither unusually protracted nor unusually involved. It will be perceived that, with a view to greater perspicuity, I have transposed, in my translation, several clauses of the Sanskrit.

The date of the ceremonial washing at Benares I should be disposed, but for the word *snátwá,* to refer to Madanapála's father rather than to Madanapála himself. But, if it was the former that bathed at that time, the instrumental case of the past participle, or *snátena,* would have been used, to agree with *chandradevena.* On the construction accepted, the year of the primitive grant is wanting; a default which might be argued as leaving, in ordinary circumstances, an opening to endless contestation retrospective from the time of its renewal.

The original document, at the issuing of the present edict, was, it should seem, lost, and not even a certificate of its date producible. But the author of the re-grant being the king, his bare admission that the grantor was his royal sire, would be sufficient to preclude all action at law bearing on the title of the village propounded in the patent.

In the recital of the forms attending the primary grant, it will be remarked that no mention is made of bathing on the part of Chandra Deva. The specification of this important observance must, for completeness, be resumed from the notice, higher up the sentence, of its performance by Madanapála; in whose case it is, perhaps, just to conclude that no other rite over and above ablution was imperative. But, to ascertain whether completeness of detail has here been sacrificed to brevity of expression, requires investigation which must be remitted to another opportunity.

‡ भागभोग, or, as elsewhere, भागाभोग; 'rent in kind:' in contrast to हिरण्य 'gold,' 'rent in cash.' See Colebrooke's Miscell. Essays, Vol. II., pp. 306 and 312.

§ Almost all inscriptions recording charters of land are embellished with some

1. He that receives land, and he that bestows land, both, as performing acts of merit, assuredly go to elysium.*

of the nine stanzas here collected, or similar ones ; little uniformity being observed, however, in their arrangement. Most of them, if not all, are, somewhere or other, attributed to Vyása or the Munis. The probability is, that they are derived from the *Mahábhárata* and the Purāṇas. One or two may be taken from the *Rámáyaṇa.* A few have been traced to their sources, mediate or immediate ; as will subsequently appear. Their various readings are numerous ; but it has not been thought necessary to adduce, in more than one or two instances, such as are immaterial. The rest are dwelt on at length.

* This couplet, attributed to a Muni, or Sage, will be found translated in Colebrooke's Digest of Hindu Law, &c., Vol. II., pp. 166, 167 : 8vo. ed. In the original I have corrected प्रतिगृह्नाति to प्रतिगृह्णाति ; and I have changed नियता to नियतं, the preferable and more frequent reading. These verses are very often met with. They occur, with minute variations, in all three of the law-works about to be named.

In express contradiction to the maxim which they deliver, a metrical precept, quoted in the *Práyas'chitta-mayúkha* and *Prayas'chitta-muktávalí,* and there wrongly imputed to the code of the Mánavas, pronounces, in substance, that the acceptor of land falls into a place of torment :

हिरण्यं भूमिमश्वं गामन्नं वासस्तिलान् घृतम् ।
अविद्वान् प्रतिगृह्णानो भस्मीभवति दारुवत् ॥

This bold enunciation is, however, in good part glossed away by refinements and exceptions. The Hindu Rhadamanthus is wonderfully tolerant of sophistry.

In the first place, the acceptance of land without a spiritual fee is ruled, by the *Dânachandriká,* to be no delinquency whatever. This act is, accordingly, not viewed as objectionable, unless an attempt is made to sanctify it by religious rites. See the last note, p. 224.

When ritual observances are connected with it, a new character at once attaches to the deed. It now becomes sinful, and demands satisfaction. One treatise prescribes, as the appropriate expiation, the penance of Prajápati and the bestowal in charity of one-sixth of the gift ; the donee retaining the remainder. Another treatise is more unrelenting in its exactions ; requiring three performances of the ardent penance, three ablutions daily for four months, and alms as before ; the residue of the donation likewise remaining with its receiver.

The penance of Prajápati is thus described : " When a twice-born man performs the *common* penance, *or that* of Prajápati, he must for three days eat only in the morning ; for three days, only in the evening ; for three days, food unasked *but presented to him ;* and for three days more, nothing." Laws of the Mánavas, XI., 212. But compare Yájvavalkya, III., 320.

Of the ardent penance we have the following account : " A Bráhman, perform-

2. A conch,* a throne, an umbrella, the best of horses, *and* the choicest of elephants; these *royal* insignia, Purandara,† are the requital of giving away land.

3. Again and again does the fortunate Ráma conjure all these *and* future lords of earth. This bridge of virtue, *the granting of land, is* common to *all* princes, and to be cared for, by your majesties, in successive ages.‡

ing the ardent penance, must swallow nothing but hot water, hot milk, hot clarified butter, and hot steam, each of them for three days successively; performing an ablution, and mortifying all his members." Laws of the Mánavas, XI., 215. Yájvavalkya—III., 318—makes it to consist in drinking hot milk, hot clarified butter, and hot water, each for a day; with fasting for one night. Parás'ara lays down the quantity of milk, butter, and water.

Land received in free gift it is wrong to dispose of by sale; but the selling of it is expiated by a solemn sacrifice—*yajna*. Again, the man who, though able to vindicate his rights, tamely relinquishes his land, when usurped by another, without recourse to litigation—*apaṭala*, goes to some hideous hell, there to remain for one and twenty cycles. If he foregoes all endeavour to obtain justice, he should destroy himself; and, by this destruction, he escapes the infernal regions. See a note above, on *Akshapaṭalika*, at p. 228.

The *Práyas'chitta-mayúkha* is by Nílakaṇṭha Bhaṭṭa, son of S'ankara; and the *Práyas'chitta-muktávalí*, is by Divákara Bhaṭṭa, son of Mahádeva Bhaṭṭa, of the *gotra* of Bharadwája. The *Dána-chandriká* has been spoken of in a previous note.

* The bare possession of a *dakshiṇávarta*, or conch with its whorls turning to the right, is esteemed, by the Hindus, as securing, without fail, good fortune to its owner. Its employment for religious ends is also thought to be productive of extraordinary results. Some verses on this topic, purporting to be taken from a chapter of the *Varáha-puráṇa*, will be found in the *S'abda-kalpa-druma*, p. 5106. These couplets inculcate, for example, that whoever sprinkles himself, in prescribed form, with water from such a shell, at a river running towards the East, is absolved from all past sin. So sacred is a shell of this description, that one may neither drink out of it, nor strike with it a fish or a swine.

† Purandara is a name of Indra.

‡ The second distich of this couplet has been strangely translated, as follows, in the Journal of the Bombay Branch of the Royal Asiatic Society, January, 1852, p. 110: "To preserve what has been granted, a common duty incumbent on all kings, is like a bridge for their safety, over an ocean of sins." Yet this is as close as the English versions of Indian inscriptions are generally.

Dr. Mill thinks that he finds the reading सत्तान् for सवान्, in a citation of this verse, given on the Shekhávátí tablet. Journal of the As. Soc. of Bengal, for 1835, pp. 384 and 400.

4. By many kings, *such as* Sagara and others, the earth has been possessed. His, ever, whose is the soil, is *its* produce.

5. He that *wrongfully* resumes a single gold coin, a cow, or even one finger's breadth of glebe, incurs perdition till the consummation of all things.*

6. He that *unjustly* confiscates land, *whether* given by himself, or given by others, transformed to a worm, grovels, with his ancestors, in ordure.†

* Another form of this couplet, but without affecting the sense, has been noticed in inscriptions:

हिरण्यमेकं गामेकां भूम्या अप्येकमङ्गुलम् ।
हरन् नरकमायाति यावदाभूतसम्प्लवम् ॥

A redundancy is observable in the fourth quarter of this stanza.

† A couplet almost identical with this, as to its first half, but combining, in a manner, for its remainder, the second distich of the stanza in the text, and the first distich of the stanza there succeeding it, occurs in the *Garuḍa-puráṇa.* With a slight variation, it is not uncommon in inscriptions. It here follows, with a part of its context:

स्वदत्तां परदत्तां वा यो हरेच्च च वसुन्धराम् ।
षष्ठिं वर्षसहस्राणि विष्ठायां जायते कृमिः ॥
भूमेरङ्गुलदाता च स कथं पुण्यमाचरेत् ।
भूमेरङ्गुलहर्ता च स कथं पापमाचरेत् ॥
ब्रह्मस्वं प्रणयाद् भुक्तं दहत्यासप्तमं कुलम् ।
तदेव चौर्यरूपेण दहत्या चन्द्रतारकम् ॥
लोहचूर्णाश्मचूर्णानि विषं च जरयेन् नरः ।
ब्रह्मस्वं त्रिषु लोकेषु कः पुमान् जरयिष्यति ॥
देवद्रव्यविनाशेन ब्रह्मस्वहरणेन च ।
कुलान्यकुलतां यान्ति ब्राह्मणातिक्रमेण च ॥

Preta-kalpa, 30*th adhyáya*, *s'l.* 15-19.

'He that usurps land, bestowed by himself, or bestowed by another, is born, for sixty thousand years a worm in ordure.

'What merit does he acquire who grants away *even* a finger's breadth of land! And what guilt does he incur who, *without just cause,* appropriates *even* a finger's breadth of land!

'The estate of a Bráhman, possessed through avarice, burns *the seizer of it* to the seventh generation. Like theft, it indeed burns *him* while the moon and the stars endure.

7. Sixty thousand years does the donor of land abide in the regions of the blessed ; *and* just as many does he dwell in hell, who practices disseizin, or acquiesces in *it.**

'A man may digest iron-filings, powdered stone, and poison. *But* what man, in the three worlds, shall digest the property of a Bráhman ?

'By the destruction of consecrated wealth, by the *inequitable* seizure of a Bráhman's fortune, and by disrespect to Bráhmans, *whole* families suffer degradation.'

In some inscriptions, the latter half of the first couplet above cited runs thus :

गवां शतसहस्रस्य हन्तुर्हरति दुष्कृतम् ।

'—contracts demerit *equal to that* of the slayer of a hundred thousand kine.'

In other inscriptions, the first distich of this stanza is materially altered, as below ; and the second distich is quite different from anything yet given :

स्वदत्तां परदत्तां वा यत्नाद् रक्ष नराधिप ।
महीं महीभृतां श्रेष्ठ दानात् श्रेयोऽनुपालनम् ॥

'Diligently do thou guard, O king, land bestowed by thyself or by others. More meritorious, most eminent of princes, is the protection *of land* than is the giving *of it.*'

The *Bhágavata-puráṇa* confines its denunciations to the sacrilegious :

स्वदत्तां परदत्तां वा ब्रह्मवृत्तिं हरेच्च यः ।
षष्टिं वर्षसहस्राणि विष्ठायां जायते कृमिः ॥

10th *skandha*, latter section, 64th *adhyáya*, 39th *s'l.*

'He who wrongfully confiscates the wealth of a Bráhman, bestowed by himself,' &c.

This couplet, with insignificant verbal deviations, is quoted by Jagannátha Tarkapanchánana Bhaṭṭáchárya, in the *Viváda-bhangárṇava*, through the *Dípa-kaliká.* See Colebrooke's Digest of Hindu Law, &c., Vol. II., pp. 165, 166 ; 8vo. ed.

Once more, from the *Bhágavata-puráṇa :*

यः स्वदत्तां परैर्दत्तां हरेत सुरविप्रयोः ।
वृत्तिं स जायते विड्भुक् वर्षाणामयुतायुतम् ॥

11th *skandha*, 27th *adhyáya*, 64th *s'l.*

'He who disseizes the gods or Bráhmans of property conferred by himself or by others, is born, during ten thousand times ten thousand years, a feeder on dung.'

* This couplet, but read a little otherwise, is cited, as from the *A'dipuráṇa*, by Jagannátha Tarkapanchánana Bhaṭṭáchárya. See the last note; and Colebrooke's Digest, &c., Vol. II., p. 163 ; 8vo. ed.

The word नरकं, in the text, would well be exchanged for नरके.

According to Yájnavalkya—III., 230,—the forcible usurpation of land is nearly tantamount, as a crime, to theft of gold. Compare the Laws of the Mánavas XI., 58.

8. The donations—a source of merit, riches, and distinction—once bestowed, here *on earth*, by kings, rank with the reliques of sacrifices and with vomitings. What respectable person, forsooth, would take them again ?*

The stealing of gold, agreeably to an anonymous text adduced in the *Práyas'-chittoddyota*, is counted among offences in the first degree :

ब्रह्महत्या सुरापानं स्तेयं गुर्वङ्गनागमः ।
स्वर्णस्तेयं च तत्कर्त्ता संसर्गो वत्सरं तथा ॥
महापापानि पञ्चैतान्युच्यन्ते ।

Equal explicitness on this article is wanting in the Laws of the Mánavas, IX, 235, and XI., 55 ; and in Yájnavalkya, III., 227.

In expiation of the purloining of gold, the *Mitákshará*, a commentary on Yájnavalkya, prescribes one observance of the ardent penance, a fast of three days' continuance, and eight thousand burnt offerings of clarified butter, with repetitions of the *gáyatrí*. It is added that the seizure of land is atoned by mortifications of half this severity.

The *Práyas'chitta-mayúkha* would visit with a much lighter animadversion, the delinquency thus absolved.

Bhaṭṭa Dinakara is author of the *Práyas'chittoddyota*. His father was Rámakṛishṇa Bhaṭṭa, son of Náráyaṇa Bhaṭṭa, son of Rámes'wara Bhaṭṭa.

My reason for calling the classical ' Laws of Menu' by the more correct title of ' Laws of the Mánavas' will be seen by reference to an interesting letter of Prof. Max Müller, in Mr. Morley's Digest of Indian Cases, Vol. I., Introduction, pp. cxcvi. seq.

* Of this couplet we owe the following version to Colebrooke : " The gifts which have been granted by former princes,—producing virtue, wealth, and fame,—are unsullied reflections. What honest man would resume them ?" Miscell. Essays, Vol. II., p. 313. For निर्माल्यवान्तप्रतिमानि, Colebrooke prints निर्माल्यवन्ति प्रतिमानि ; his facsimile giving, however, *vánti :* and *vánti* may, by a strain, be taken, here, to import the same as *vánta*. *Vánti* occurs in this Journal for 1838, p. 738. But either reading is fatal to this great scholar's construction. This couplet, worded as in the present inscription, but ill-rendered into English, will be found in our Journal for 1839, pp. 299, 303 ; and for 1841, pp. 101, 104. For the like reading, and a correct interpretation, see this Journal for 1839, pp. 487, 494. Compare, further, the As. Res., Vol. I., p. 365, 8vo. ed. ; and Vol. XV., p. 452.

An obvious objection to Colebrooke's lection,—which seems to be a tacit alteration of his original,—resides in the awkward, and perhaps impurely formed word *nirmályavat*, to signify scarcely more than what is expressed by *nirmala ;* and in the unnatural air imparted to the whole stanza, as the result of taking *pratimáni*,

9. Inconstant as the rack is this *vaunted* kingship. Sweet for but the passing moment are the delights of things of sense. Like

for the plural of the substantive *pratimána*. Another proof that the view which I here adopt is correct, is afforded by the fact that, in other inscriptions, the words *nirbhukta-málya* stand in the place of *nirmálya-vánta*. See this Journal for 1838, pp. 914, 973. *Nirbhukta-málya*, 'discarded flowers,' or flowers once flung on an idol, and not to be re-employed in the same manner.

Professor Wilson, in his Sanskrit Dictionary, neglects to distinguish, with respect to their derivation, between the terms *nirmálya* 'pure,' 'purity' and *nirmálya* 'the remains of an offering.' As to the latter, its second factor, which is *málya* 'flowers,' has nothing to do with *mala* 'impurity.' When our *nirmálya* is taken in its ordinary comprehensive acceptation, the element *málya* is to be understood illustratively, as sub-indicating or connoting all articles of food, &c., while literally denoting blossoms; all which are alike rendered, by oblation, unfit to be used again for a like purpose.

The reliques of oblations to S'iva form a fertile theme of disquisition in Hindu law-books. The subjoined injunctions and distinctions have been collected from the *Nirṇaya-sindhu*, which treats of this subject in the first section of its third book.

According to the *Siddhánta-s'ekhara*, as there quoted, edibles, water, betel, powdered sandal-wood, and flowers, which have been devoted to S'iva, become the perquisites of Chaṇḍa or Chaṇḍes'a. To sell them, or other things so offered, or to give them away, or to take any of them for food, whether voluntarily or involuntarily, is reputed a grave offence, and requires the reparation of grievous penances. The *Smṛityartha-sára* pronounces that whoever perseveres in eating any article thus offered, is degraded from his class; and that great, though inferior, guilt is incurred by partaking in diet of the sacrificial leavings of any deity whatever, in times exempt from distress. A reservation is made, however, by the *Bhavishya-puráṇa*, on behalf of all votaries of S'iva, and all who have received his initiatory incantation, as concerns objects presented to the twelve *Jyotirlingas*, phalli from the river Báṇa near Jubulpore, such as are spontaneous, or ideal, or set up by gods or divine sages, or composed of ammonite, the moon-stone, or any metal. Chaṇḍa has here no claim. The phalli meant to be excepted are those of stone, erected by common mortals, and such as are fashioned of plastic mud, turmeric, clarified butter, &c.

The *Traivikramí* cites the *Skanda-puráṇa* as further imputing great sanctity to images of S'iva in the human form. The eating, by a proper person, of offerings consecrated to such idols, avails to expunge even the crime of Bráhmanicide. An improper person, on the credit of this Puráṇa, is one unbathed. Other authorities consider as out of the pale, all who do not wear the thread of regeneration; and S'rídatta would deny the privilege to all save initiated followers of S'iva. The

a dew-drop on the point of a spear of grass is the vital breath of human kind. Ah! virtue is *one's* sole companion on the journey

S'iva-puráṇa is still more comprehensive in its enumeration of those who are disqualified for partaking of the sacred food. The *Kás'í-khaṇḍa* eulogizes the practice of wetting the head with water with which the priapic emblem of S'iva has been sprinkled. The merit of so doing is alleged to be equal to that of bathing in the Ganges; and he who thrice drinks water that drips from the *linga*, is cleansed from all the three classes of sin,—the corporeal, verbal, and mental.

The *Tithi-tattwa*, *Hemádri*, and *Paris'ishṭa* assert that food, leaves, flowers, fruit, and water, offered to S'iva, acquire purity only when he is represented by the ammonite, in the worship of the *pancháyatana*, or '*receptacle of five deities, or types.*'

The deities represented, or symbolized in the *pancháyatana* are S'iva, Vishṇu, Súrya, Gaṇes'a, and Durgá. Four of the images, or types are arranged around the fifth, the most highly considered of all; and this varies accordingly as the worshipper is a S'aiva, a Vaishṇava, a Sawra, a Gáṇapatya, or a S'akta.

In the *Nirṇaya-sindhu*, Bopadeva and the *Padárthádars'a* and vouched for the disposition of these idols, or symbols. In the *A'chárárka* a memorial verse is, more commodiously recited, to suggest their succession:

शंनासूगभनाशङ्गसूभसूशङ्गनाभग- ।
नाशंसूभभनाशङ्गसूवित्यं संस्थाप्य पूजयेत् ॥

S'am stands for S'ankara, or S'iva; *Ná*, for Náráyaṇa, or Vishṇu; *Sú*, for Súrya; *Ga*, for Gaṇes'a; and *Bha*, for Bhagavatí, or Durgá. The first named divinity of each group comes in the centre. The rest, in the order here shown, are placed about him, at the interquarters, beginning with the N. E.

Sometimes these images are seen collected in temples. They are then of liberal dimensions; and only one of the five objects, the obscene emblem of S'iva, has other than an animal form, more or less distorted. Most Hindus have a private set of the five types, on a small scale. These they carry in a metallic vessel, hemispherical in shape, about an inch and a half in diameter, provided with a cover, and having a stiff paper bottom to preserve these reverend remembrancers from falling into horizontal confusion. The vessel is now and then constructed in the similitude of a lotus. The symbolical substitutes of S'iva, Vishṇu, Súrya, Gaṇes'a, and Durgá, are, in order as enumerated, a phallus of stone from the Baṇa, an ammonite from the Gaṇḍakí, a piece of the crystal called *súryakánta*, some leaves of the red-blossomed oleander, and a lump of pyritic iron-ore.

The *Nirṇaya-sindhu* or *Nirṇaya-kamalákara* has, for its author, Kamalákara Bhaṭṭa, son of Rámakrishṇa Bhaṭṭa and Umá, and younger brother of Divákara Bhaṭṭa. It was composed in the Samvat year 1661, or A. D. 1718. The *A'chárárka* is by S'ankara Bhaṭṭa, son of Nílakaṇṭha Bhaṭṭa, son of S'ankara Bhaṭṭa.

to the other world.*

10. This ratification of patent, promulgating *his* father's donation, the auspicious Madava Deva procured to be executed, with his proper seal *thereto attached.*

Engrossed by the respectable† and thrifty Sahadeva, scrivener.‡

Prosperity *be* here! *May* favourable fortune *and* great felicity *attend!*

Executed by the illustrious Madanapála Deva.

Of the inscription given below, a negative facsimile in lithograph will be found in the Journal of the Archæological Society of Delhi, for September, 1852. To test this facsimile I have been assisted by a careful transcript of the original, for which I am indebted to the late Mr. F. Taylor, Principal of the Delhi College. In the Journal above mentioned is a professed translation of the inscription under consideration. Its inaccuracies, as to facts of

* Colebrooke's version of this stanza is as follows: "This sovereignty of the earth totters with the stormy blast; the enjoyment of a realm is sweet but for an instant; the breath of man is like a drop of water on the tip of a blade of grass; virtue is the greatest friend in the journey of the other world." Miscell. Essays, Vol. II., p. 309; also p. 304.

But *vátábhra* is certainly a cloud borne by the wind, or tossed by the storm; rack, in a word. Again; where I have written 'kingship,' Colebrooke puts "sovereignty of the earth," instead of 'sovereignty of earth." The word *vishaya*, which I have translated 'things of sense,' may mean "realm:" but to render it so in this place produces at least an approach to tantology which I cannot believe is designed in the original.

† The original term, ठक्कुर, Colebrooke twice renders by "venerable." Miscell. Essays, Vol. II., pp. 305 and 314. In the present instance I suspect that it denotes some office.

‡ In Sanskrit, करणिक, which I take to be related to *karaṇa* "the usage or practice of the writer-caste," according to Professor Wilson. It therefore signifies a Káyastha or hereditary scribe. An allowable form, in the same sense, is *karaṇin*, which makes *karaṇí* in the nominative. Can it be from this that the word 'cranie' is corrupted? See Sir H. M. Elliot's Supplemental Glossary, pp. 196, 197.

I have not neglected to observe the words कर्णिक and करणिन in this Journal for 1837, p. 783, and for 1838, p. 46, respectively.

minor importance, are numerous; but it seems unnecessary to make them the subject of detail. The remarks, by the Secretary of the Society, while correcting* some of Mr. Prinsep's statements† touching the dynasty in discussion, were obviously made without recourse to that gentleman's reference,‡ and in ignorance of what had been written, by Professor Wilson,§ regarding the later kings of Kanoj.

स्वस्ति ।

अकुण्ठोत्कण्ठवैकुण्ठकण्ठपीठलुठत्करः ।
संरम्भः सुरतारम्भे स श्रियः श्रेयसेऽस्तु वः ॥ १ ॥
आसीदशीतद्युतिवंशजातक्ष्मापालमालासु दिवं गतासु ।
साक्षाद् विवस्वानिव भूरिधाम्ना नाम्ना यशोविग्रह इत्युदारः॥२॥
तत्सुतोऽभून् महीचन्द्रश्चन्द्रधामनिभं निजम् ।
येनाऽपारमकूपारपारे व्यापारितं यशः ॥ ३ ॥
तस्याऽभूत् तनयो नयैकरसिकः क्रान्तद्विषन्मण्डलो
विध्वस्तोद्धतवीरयोधतिमिरः श्रीचन्द्रदेवो नृपः ।
येनोदारतरप्रतापशमिताशेषप्रजोपद्रवं
श्रीमद्गाधिपुराधिराज्यमसमं दोर्विक्रमेणार्जितम् ॥ ४ ॥
तीर्थानि काशिकुशिकोत्तरकोशलेन्द्र-
स्थानीयकानि परिपालयताऽभिगम्य ।
हेमात्मतुल्यमनिशं ददता द्विजेभ्यो
येनाङ्किता वसुमती शतशस्तुलाभिः ॥ ५ ॥
तस्याऽऽत्मजो मदनपाल इति क्षितीन्द्र-
चूडामणिर्विजयते निजगोत्रचन्द्रः ।
यस्याऽभिषेककलशोल्लसितैः पयोभिः
प्रक्षालितं कलिरजःपटलं धरित्र्याः ॥ ६ ॥

* Journal of the Archæolog. Society of Delhi, for September, 1852, p. 3. There is a mistake, however, in quoting the year 1075, instead of 1072.

† Useful Tables, Part the Second, p. 110. The carelessness here exhibited is a rare thing to meet with in this laborious and most convenient compendium.

‡ Journal of the Asiatic Soc. of Bengal, for 1834, p. 341.

§ As. Res., Vol. XV., pp. 460 seqq.

यस्याऽऽसीद् विजयप्रयाणसमये तुङ्गाचलोच्चैस्चलन्-
माद्यत्कुम्भिपदक्रमासमभरभ्रश्यन्महीमण्डले ।
चूडारत्नविभिन्नतालुगलितस्त्यानास्रगुद्भासितः
शेषः पेषवशादिव क्षणमसौ क्रोडे निलीनाननः ॥ ७ ॥
तस्मादजायत निजायतबाहुवल्लि-
बन्धावरुद्धनवराष्ट्रगजो नरेन्द्रः ।
सान्द्रामृतद्रवमुचां प्रभवो गवां यो
गोविन्दचन्द्र इति चन्द्र इवाऽम्बुराशेः ॥ ८ ॥
न कथमप्यलभन्त रणक्षमांस्-
तिसृषु दिक्षु गजानथ वज्रिणः ।
ककुभि बभ्रमुरभ्रमुवल्लभ-
प्रतिभटा इव यस्य घटा गजाः ॥ ९ ॥

सोऽयं समस्तराजचक्रसंसेवितचरणः परमभट्टारकमहाराजाधिराजपरमेश्वरपरममाहेश्वरनिजभुजोपार्जितश्रीकन्यकुब्जाधिपत्यश्रीचन्द्रदेवपादानुध्यातपरमभट्टारकमहाराजाधिराजपरमेश्वरपरममाहेश्वरश्रीमदनपालदेवपादानुध्यातपरमभट्टारकमहाराजाधिराजपरमेश्वरपरममाहेश्वराश्वपतिगजपतिनरपतिराजत्रयाधिपतिविविधविद्याविचारवाचस्पतिश्रीमद्गोविन्दचन्द्रदेवो विजयी हलदोयपत्तलायामागोडलीग्रामनिवासिनो निखिलजनपदानुपगतानपि च राजराज्ञीयुवराजमन्त्रिपुरोहितप्रतीहारसेनापतिभाण्डागारिकाक्षपटलिकभिषग्नैमित्तिकान्तःपुरिकदूतकरितुरगपत्तनाकरस्थानगोकुलाधिकारिपुरुषानाज्ञापयति बोधयत्यादिशति च ।

यथा विदितमस्तु भवतां यथोपरिलिखितग्रामः सजलस्थलः सलोहलवणाकरः समत्स्याकरः सगर्तोषरः समधूकाम्रवनवाटिकाविटपतृणयूतिगोचरपर्यन्तः सोर्ध्वाधश्चतुराघाटविशुद्धः स्वसीमापर्यन्तः द्व्यशीत्यधिकैकादशशतसंवत्सरे माघमासि कृष्णपक्षे षष्ठ्यां तिथावङ्कतः संवत् ११८२ माघवदि ६ शुक्रे श्रीप्रतिष्ठाने गङ्गायां स्नात्वा विधिवन् मन्त्रदेवमुनिमनुजभूतपितृगणांस्तर्पयित्वा तिमिरपटलपाटनपटुमहसमुष्णरोचिषमुपस्थायौषधिपतिशकलशेखरं समभ्यर्च्य त्रिभुवनत्रातुर्वासुदेवस्य पूजां विधाय प्रचुरपायसेन हविषा हविर्भुजं हुत्वा मातापित्रोरात्मनश्च पुण्ययशोभिवृद्धयेऽस्माभिर्गोकर्णकुशलतापूतक-

रतलोदकपूर्वं गौतमगोत्राभ्यां गौतमाङ्गिरसौतथ्यत्रिप्रवराभ्यां ठक्कु-
रोत्तमपौत्राभ्यां ठक्कुरश्रीस्वाल्हाणपुत्राभ्यां श्रीक्षीक्काश्रीवाक्कटशर्मभ्या-
माचन्द्रार्कं यावत् शासनीकृत्य प्रदत्तौ मत्वा यथा दीयमानभागभोग-
करप्रवणिकरतुरुष्कदण्डप्रभृतिसर्वदायानाज्ञाविधेयीभूय दास्यथेति ।

भवन्ति चाऽत्र श्लोकाः ।

भूमिं यः प्रतिगृह्णाति यश्च भूमिं प्रयच्छति ।
उभौ तौ पुण्यकर्माणौ नियतं स्वर्गगामिनौ ॥ १ ॥
शङ्खं भद्रासनं छत्रं वराश्वा वरवारणाः ।
भूमिदानस्य चिह्नानि फलमेतत् पुरन्दर ॥ २ ॥
सर्वानेतान् भाविनः पार्थिवेन्द्रान्
भूयो भूयो याचते रामभद्रः ।
सामान्योऽयं धर्मसेतुर्नृपाणां
काले काले पालनीयो भवद्भिः ॥ ३ ॥
बहुभिर्वसुधा भुक्ता राजभिः सगरादिभिः ।
यस्य यस्य यदा भूमिस्तस्य तस्य तदा फलम् ॥ ४ ॥
गामेकां स्वर्णमेकं च भूमेरप्येकमङ्गुलम् ।
हरन् नरकमाप्नोति यावदाभूतसम्प्लवम् ॥ ५ ॥
तडागानां सहस्रेणाऽप्यश्वमेधशतेन च ।
गवां कोटिप्रदानेन भूमिहर्ता न शुध्यति ॥ ६ ॥

लिखितं चेदं ताम्रपट्टकं ठक्कुरश्रीविश्वरूपेणेति ।

TRANSLATION.*

* * * * * * * * * *

* * * * * * * * * *

8. From him was born Govindachandra, as the moon *was pro-*

* The first seven stanzas of the present inscription are a mere repetition of the opening of the former grant, if a few verbal discrepancies be left out of account.

It may be that, in the fourth stanza, we should read धीर for वीर; 'resolute' in place of 'valiant.' In Jayachandra's grant, at p. 98 of this Journal for 1841, the word is वीर. Capt. Fell, from his version of another of Jayachandra's patents,—in the fifteenth volume of the Asiatic Researches, p. 447,—seems to have had the same word before him. The Sanskrit of that patent has never been printed.

duced from the main ;* a king by whom, with his far-reaching creepers of arms,† elephant-like upstart governments‡ were seized and coerced; *and* who *was* a fountain of eloquence copiously distilling the essence of *rhetorical* nectar :

In the sixth stanza, कलिरजः पटलं 'the accumulated dust,' &c. is substituted for कलिरजः सकलं 'all the dust,' or 'the dust, wholly,' &c. Capt. Fell is too general to suggest what expression was here employed in his original just alluded to. The other grant of Jayachandra's has सकलं.

The same stanza, in this inscription, as in the last, in extolling Madanapála, exhibits विजयते 'bears sway,' a present tense; though an indication of past time is here indispensable. It should seem that, notwithstanding the exigency of a new reign, the later poetical conveyancers entertained by the kings of Kanoj, were either unwilling or unable to mend the verses of their predecessor under Madanapála. Capt. Fell puts "was a victorious prince;" but without comment. "Was glorious" is the rendering given elsewhere; and likewise unaccompanied by any remark. Journal of the As. Soc. of Bengal, for 1841, p. 101.

* The more popular origin of the moon is from the ocean of milk, at the time it was churned by the immortals and the demons. *Mahábhárata*, *A'di-parvan*, *s'l.* 1145.

According to other accounts, the moon was son of Atri. "The *Váyu* says the essence of Soma—*somatwa*—issued from the eyes of Atri, and impregnated the ten quarters. The *Bhágavata* says merely that Soma was born from the eyes of Atri." Translation of the *Vishṇu-puráṇa*, p. 392, foot-note.

The history of the moon, prior to its extraction from the milky sea, in a legend which has a very Pauráṇika air, but which I have not been able to authenticate, is thus told by Capt. Fell: "A ray of glory from the eye of the holy saint Atri was so effulgent, that the Eastern quarter could not endure it. It was, accordingly, thrown into the ocean, where it became the moon." As. Res. Vol. XV., p. 455.

In the *Purusha-súkta* of the *Ṛig-veda*, the derivation of the moon is stated still differently. See Colebrooke's Miscell. Essays, Vol. I., p. 168.

† Long arms, or 'arms reaching to the knees,' are reputed, among the Hindus, a token of high lineage. The arm is, further, frequently compared, by them, to a vine, or to a staff.

‡ Capt. Fell ineptly explains the compound here translated 'upstart governments,'—or *nava-ráshṭra*,—as intending "Navaráshṭra, a country in the South of India; mentioned in the chapter of the *Mahábhárata*, detailing Sahadeva's conquests." As. Res., Vol. XV., p. 455.

But a king would, most assuredly, be much more likely to boast of successful subjugation, than of being endowed with bone and muscle sufficient to overmaster a wild beast, however powerful.

9. Whose embattled elephants in no wise succeeded in finding, in three of the quarters, *celestial* elephants equal to the conflict; whereupon, as it were rivals of the mate of Abhramu, they wended to the region of Vajrin.*

The same:—whose feet are highly revered by the universal fraternity of potentates: son and successor of the auspicious Madanapála Deva, supreme sovereign, great king, chief ruler, lord paramount, emperor: *who was* son and successor of the auspicious Chandra Deva, supreme sovereign, great king, chief ruler, lord paramount, emperor; who gained, with his own arm, the primacy of happy Kanyakubja:—the fortunate Govindachandra Deva,† supreme sovereign, great king, chief ruler, lord paramount, emperor;

* The Hindu mythology places an elephant, to uphold the globe, at each of its quarters and interquarters. Of these eight supporters, Airávata is esteemed the most redoubtable, and the chief of his kind. A female companion is attached to each of them; that of Airávata being Abhramu. Vajrin is an appellation of Indra; from *vajra*, the name of his weapon: and his region is the East, the station of Airávata.

Prof. Wilson, in his Dictionary, erroneously places Airávata in the North, the locality of Sárvabhauma. In this mistake he is followed by Mr. Thomson, in his translation of the *Bhagavad-gítá*, p. 125.

The original of this exordium, from which Capt. Fell translated, was, beyond question, everywhere substantially, and almost everywhere literally, identical with the Sanskrit as printed in this paper. His version throughout is not, however, entirely trustworthy; as an examination of the mode in which he renders the last two stanzas might authorize one to infer, a general scrutiny apart.

"As the moon was produced from the ocean, so from Madanapála was descended Govindachandra. He was a prince of such vast strength that, by the grasp of his mighty arm, he was able to restrain an elephant of the kingdom of Navaráshṭra. He possessed cows giving streams of the richest milk.

"His herds of elephants could never meet with equals for combat in three regions—the North, South, and West. They, therefore, roved to the quarter sacred to Indra—the East;—seeking for Airávata. They were like warriors seeking for their adversaries." As. Res., Vol. XV., p. 448.

† The seal attached to the plate of copper containing this inscription, bears, according to the lithograph in the Journal of the Archæological Society of Delhi, the words श्रीमद्गोविन्दवद्देव: But this must be a mistake for श्रीमद्गोविन्दचन्द्रदेव: 'The auspicious Govindachandra Deva.' Above the name is a figure of Garuḍa; and below it is a conch.

suzerain of the three *classes of* Governors *styled* masters of cavalry, masters of elephants, and masters of infantry;* a Váchaspati† for inquisition into various sciences; victorious; charges, acquaints, and enjoins the inhabitants of the village of A'goḍalí,‡ in the canton§ of Haladoya; and all *his* subjects; and likewise sojourners from abroad; as also kings, queens, princes consort, *imperial* coun-

* *As'wapati*, *gajapati*, and *narapati*. The import of these phrases, as here employed, is undetermined. A cognate term, *chhatrapati* 'master of umbrellas,' may be named as sometimes associated with them. The first three expressions might be taken to denote, severally, the possession of a component part of an army; were it not for the omission of chariots, which are necessary, as a fourth element, to make up a complete martial host. But the word *rathapati* 'master of chariots' is never found, instead of *chhatrapati*, connected as above; and, if so found, in order to stand as a synonyme of it, *chhatra* must bear a sense at present unrecognised.

The epithet *gajapati* is known to have been affixed, from a certain age, to the names of the rulers of Orissa; the title of *narapati*—an ordinary equivalent of 'king'—is said to have been specially borne, at one time, by the sovereigns of Telingana and Karṇáṭa; and the designation *chhatrapati* was affected by the Peshwas. The appropriation of *as'wapati* may admit of doubt.

It seems not impossible that, by these distinctions, so many feudatories, or classes of feudatories, of a paramount power were once discriminated. On this point, however, authentic history is, at best, only suggestive. As for the rest, it had already become the custom of Indian governors, early in the middle ages, to arrogate the lordship of three of these orders of royalets,—if they may so be considered. Among the Kanoj kings, Govindachandra was, apparently, the first who laid claim to this sort of pre-eminence. That a similar superiority was not asserted with respect to the chhatrapatis, is a circumstance worthy of note. Can it be that the Chhatrapati *rájá*, or *rájás*, whoever they were, enjoyed sufficient power to deter such a pretension? As. Res., Vol. IX., p. 123; and Vol. XV., p. 254. Journal of the As. Soc. of Bengal, for 1838, p. 49; for 1839, p. 485; and for 1841, p. 103. Mackenzie Collection, Vol. II., pp. ccxxxv., ccxxxvi., and ccxxxviii.; where the mere names, of like aspect, of Gaṇapati, Venkaṭapati, and Setupati will also be seen. Useful Tables, Part the Second, p. 119. Preface to the *Prauḍha-pratápa-mártaṇḍa*, a law work. Preface to the *Siddhánta-chandriká*, the earliest commentary on the *S'ástra-dípiká* of the Mímánsá.

† Or Bṛihaspati; preceptor of the gods.

‡ There is, possibly, on the copper-plate, a stroke of punctuation after the word preceding this name, and a mark of suspense under its final consonant. In that case, we must read 'Goḍalí.'

§ In the original, *paṭṭalá*. See a note on the preceding inscription.

sellors, chaplains *royal*, warders of the gate, generalissimos, treasurers, justiciaries, physicians, diviners, custodians of the female apartment, envoys, and persons holding the proprietorship of elephants, of horses, of towns, of mines, and of herds of black cattle.

Be it known to you accordingly as *is here written:* that the aforesaid village, with its water and soil, with its iron-mines and salt-pits, with its fisheries,* with its holes and saline wastes, with and including its groves of *madhúkas* and mango trees, its orchards, timber, grass, and pasturage, with *everything* above and below, its four abuttals being adjusted, as far as its borders: on the sixth day of the dark semi-lunation, in the month of *Mágha*, in the year eleven hundred and eighty-two; *or*, expressed in numerals, on Friday, the 6th day of the moon's wane, in *Mágha, Samvat* 1182: was by us granted,† by patent, for as long as the moon and sun shall endure:—having bathed in the Ganges, at S′rís′a-pratishṭhána;‡ having satisfied, in due form, the divinities of the Vedas, the saints, *deceased* mortals, malignant spirits, and *our own* group of progenitors; paying homage to the sun, of brilliance potent in penetrating the regions of darkness; worshipping him on whose brow is a segment of the moon; adoring Vásudeva, the protector of the triple world; offering to fire an oblation of abundant rice, milk, and sugar; *and* in order to promote the desert and renown of our mother, of our father, and of ourself; taking water in our palm purified by *bending it into the shape of* a cow's ear, and by *kus′a* grass:—to the fortunate Chhíchhá S′arman and Váchhaṭa S′arman, sons

* This appurtenance of landed property is an addition to the particularities of the former grant. Its recital may be taken to mark an advance in the refinements of conveyancing.

† Several unquestionable blunders of the lithographer, or of the engraver, I have silently corrected, in transcribing the original: for instance, in the Sanskrit of this word, प्रदत्त्वा, for प्रदत्तो; and above, संरग्नः for संरम्भः, यार for योध, अतिगम्य for अभिगम्य, and a general misuse of the sibilants. This inscription, like the former, also has ह्विर्भुजं, नरकं, &c.; which have already been the subject of remark.

‡ S′rís′a, or 'the lord of S′rí,' is Vishṇu. If S′rís′a-pratishṭhána be not the name of a town, it may, perhaps, indicate the celebrated temple of Bindu-mádhava at Benares, on the bank of the Ganges.

of the venerable* and auspicious A'lhaṇa,† grandsons of the venerable Uttama, and *descended* from the stock of Gautama and the three lines of Gautama, A'ngirasa, and Autathya.

Giving heed *to this endowment*, and observant of *our* commands, you will discharge all dues, as they fall to be liquidated; *to wit*, share of produce, tribute, quadrivial tolls, Muhammadan amercements,‡ and the like.

Bearing on this topic are *these* couplets:§

* * * * * * * *

* * * * * * * *

6. Not by *the digging of* a thousand reservoirs, nor even by a hundred hippocausts, nor by the gift of ten millions of kine, does the resumer of land make expiation.||

* The original word is *thakkura;* and so of the 'venerable,' qualifying the name of Uttama. See a note at p. 241, supra.

† In the abstract translation of this inscription, above referred to, this name is strangely metamorphosed into "Alhad Pathuck Ras, a Brahmin of Singolee." A'godalí will account for "Singolee."

‡ The latter two classes of impositions are not specified in the previous inscription. From the first of them it may possibly be inferrible that the impoverishment of the imperial coffers had recently given rise to a new species of fiscal exaction; and, from the other, that the encroachments of the Northern invaders were gaining head, and that their domination was beginning to be recognised.

§ Of the six stanzas with which this instrument terminates, the first five are, with the exception of various readings, identical with the first five at the end of the former inscription. In the second distich at the conclusion of the present grant, we have, but without change of import, वराश्वा वरवारणाः in place of वराश्व-वरवारणाः. In the fifth distich, again, we here find a transposition; equally immaterial: गामेकां स्वर्णमेकं च for सुवर्णमेकं गामेकां.

|| In one place where this couplet occurs, the reading is सहस्रेण वाजपेयशतन 'by a thousand repetitions of the *vájapeya* sacrifice;' at which seventeen victims were immolated; and मुच्यति 'obtains emancipation' for शुध्यति 'performs atonement.' See Journal of the As. Soc. of Bengal, for 1841, p. 100.

Elsewhere, the word अपि, in the first measure of this couplet, is omitted. Journal of the As. Soc. of Bengal, for 1839, p. 493.

The immolation of a horse was once accounted "the king of sacrifices," and equal to efface all sin. See the laws of the Mánavas, XI., 261; and Colebrooke's Miscell. Essays, Vol. I, p. 238.

This grant on copper was indited by the respectable and thrifty Vis'warúpa.

Index to the Metres in these Inscriptions.

Stanza. First Inscription, before the prose.

1, 3. *Anushṭubh.*

2. *Indravajrá.*

4, 7. *S'árdúlavikríḍita.*

5, 6. *Vasantatilaká.*

After the prose.

1, 2, 4—7, 10. *Anushṭubh.*

3. *S'áliní.*

8. *Indravajrá.*

9. *Vasantatilaká.*

Second Inscription, before the prose.

1—7. As in the first inscription.

8. *Vasantatilaká.*

9. *Drutavilambita.*

After the prose.

1—5. As in the first inscription.

6. *Anushṭubh.*

Fort-Saugor, July 9, 1857.

The proper time for entering on the performance of this sacred rite was, according to Mahídhara, the eighth day of the moon's increase in Phálguna ; and, in the fabulous days of longevity and leisure, it was piously prolonged to twenty-seven years. Weber's White *Yajur-veda*, pp. 692 and 772.

That the sacrifice of a horse was not, originally, allegorical, is now placed beyond doubt. The animal was cooked, and some of it was eaten. Prof. Wilson thinks that part of the flesh was boiled, and part of it roasted. More probably, however, after the preparation of a broth, the meat was transferred from the caldrons to the spits. In the present day, Hindus who use animal food invariably deal with it after this manner. See the English Translation of the *Ṛig-veda*, Vol. II., p. 117, foot-note.

From the *Mahábhárata* it appears that, at a later period than the Vaidika, it was held sufficient to inhale the fumes of the seething gelatin of the victim. The whole was afterwards burnt. *As'wamedha-parvan*, s'l. 2644-2648.

Catalogue of the Coins in the Cabinet of the late Col. Stacy, *with the estimated prices attached.**—*By* E. Thomas, *Esq., late of the B. C. S.*

Greek Coins.

Gold.	Silver.	Copper.		Rs.	As.	P.
—	1	—	Drachma Alexander the Great, ...	5	0	0
—	1	—	Hemidrachma—Seleucus Nicator,......... Obv. Head with Lion's-skin as in Alexander's Coins. Rev. Jove seated, Inscription ΒΑΣΙΛΕΩΣ ΣΕΛΕΥΚΟΥ. Monogram HB	12	0	0
—	1	—	Tetradrachma of Antiochus Magnus—Wt. 252 grains—Obverse a very perfect head, in high relief. Reverse, Apollo sitting on the cortina, Inscription ΒΑΣΙΛΕΩΣ [ΑΝ] ΤΙΟΧΟΥ...............	50	0	0
—	1	—	Ptolemy—with Eagle reverse—Wt. 211 grains, ...	10	0	0
—	2	—	Ditto less perfect, at 6 each, ...	12	0	0
—	—	2	2 Copper Coins, at 1 each (2 *silver* casts)	2	0	0
			Bactrian Coins.			
			Euthydemus.			
—	5	—	Four Tetradrachms as in "*Ariana Antiqua*," plate I. figs. 6, 7 and 8—one ditto as No. 11, at 8 Rs.,@	40	0	0
—	—	5	One very perfect specimen A. A. pl. I. fig. 13, ...	16	0	0
			One ditto very good 6—three bad at 2	12	0	0
			Demetrius.			
—	3	—	Two Oboli as in A. A. pl. II. figs. 4 & 5, one very perfect, at 12 and 5, ...	17	0	0
			One with *Kausia* as in A. A. supp. pl. fig. 12, ...	14	0	0
			Apollodotus.			
—	1	—	A. A. pl. IV. fig. 15, coin imperfect, ...	8	0	0
—	2	—	A. A. pl. IV. fig. 14, in very good order, at 6, ...	12	0	0
„	17	7		210	0	0

* This Catalogue was received through Mr. Grote after the subscription had been set on foot by the Society for the purchase of this collection in its integrity. It is published with the valuation of each piece as fixed by Mr. Thomas when the Trustees of the British Museum ware negotiating for the purchase of the Cabinet, because it is believed that Mofussil collectors will be glad to have such particulars. —Eds.

Gold.	Silver.	Copper.		Rs.	As.	P
„	17	7	Brought forward,.................	210	0	0
—	—	3	A. A. pl. IV. fig. 16, in bad order, ...			
—	—	6	Four of the type given under No. 17, pl. IV. A. A. and two of a slightly varied device, at 1 each,..........................	9	0	0
			EUCRATIDES.			
—	1	—	A Drachma, not in A. A., Cunningham, pl. V. fig. 2, in very good order,.........	20	0	0
—	10	—	Oboli, A. A. pl. III. fig. 5, imperfect, at 1-8,	15	0	0
—	4	—	Ditto, A. A. ditto fig. 6, ditto, at 1-8, ...	6	0	0
—	—	1	Coin as A. A. ditto fig. 9, very perfect,...	8	0	0
—	—	6	Copper damaged, at 8 as.,...................	3	0	0
			HELIOCLES.			
—	1	—	Hemidrachma, No. 8, supp. pl. A. A. ...	50	0	0
—	—	1	Cunningham, pl. II. fig. 9. Rare but imperfect, ...	2	0	0
			ANTIMACHUS.			
—	6	—	Six very perfect Silver Coins, A. A. II. 15, at 7 each, ...	42	0	0
			AMYNTAS.			
—	—	1	In very good order. Original engraved J. A. S. B. Vol. V. pl. 46, fig. 1, ... Type as in fig. 14, pl. II. A. A............	16	0	0
			ANTIALCIDAS.			
—	1	—	One S. Coin. Fig. 12, pl. II. A. A. very perfect and rare, ...	12	0	0
—	3	—	Hemidrachma's as No. 11, pl. II. A. A. very perfect, at 7, ...	21	0	0
—	3	—	Ditto as No. 3, pl. VII. *Cunningham*, (not in A. A.) two specimens imperfect, one in very good order, at 6, ...	18	0	0
—	—	1	Copper, as fig. 13, pl. II. A. A. in good preservation, ...	3	0	0
			VONONES.			
—	—	2	Cunningham, pl. VII. fig. 5. Rare, but in bad order, at 1-4,.........................	2	8	0
—	—	1	Vonones and Azas, unpublished type. Obv. Hercules with Club. Rev. Panther as in A. A. VII. 8, but in the reverse direction, in fair order, ...	16	0	0
			ARCHEBIUS.			
—	—	1	Circular Coin, Victory and Owl, imperfect, (1 Silver Forgery.)	10	0	0
—	—	1	Square Spalygis, A. A. VIII. fig. 13, in good order, ... (1 Silver Forgery do.)	6	0	0
„	46	31		469	8	0

Gold.	Silver.	Copper.		Rs.	As.	P.
„	46	31	Brought forward,..................	469	8	0
—	—	8	Hermæus, imperfect, at 8 as.,................	4	0	0
—	—	4	Kadaphes, A. A. XI. 14, in fair order, at 1-4, ...	5	0	0
—	—	25	Kadphises, bad, at 1 anna,..................	1	9	0
			ABDAGASES.			
—	—	1	In fair order—rare,............................	2	8	0
—	1	—	Small Silver Coin Gondophares,............	2	0	0
—	—	14	Copper Coins of ditto, at 2 as., ...	1	12	0
—	—	6	Ditto of dynasty of ditto, at 2, ...	0	12	0
			MENANDER.			
—	41	—	A. A. IV. 1.—Very perfect coins with 4 varieties of mint-marks, ...			
—	13	—	Bare-headed obverse, ...	50	0	0
—	21	—	Helmed head obverse, *all* in first rate condition, (75 coins, at 12 as. each),...			
—	1	—	Helmed head, with Owl *reverse,*	10	0	0
—	—	8	Copper Coins, at 8 as. (and five Silver Forgeries), ...	4	0	0
			MOAS, &c.			
—	2	—	Elephant head, type A. A. pl. VIII. fig. 11, *worn?* at 2 Rs., ...	4	0	0
—	2	—	Azas,—one Cunningham, XII. 6; one new type, obv. Horseman. Rev. Minerva Promachus, at 6 and 12,..................	18	0	0
—	2	—	Small Coins Azas, at 1 R. each,............	2	0	0
—	—	57	Fifty-seven Copper Coins, some good types in fair order, at 4 as., ...	14	4	0
—	—	29	Pakores, imperfect, at 2 as., ...	3	10	0
—	—	33	Small Eucratides, at 1 anna.,...............	2	1	0
—	—	10	Pakores style of obverse, with reverses, Fire Altars, each 2, ...	1	4	0
—	—	2	Old Indo-Bactrian type, A. A. XV. figs. 26 and 27, at 12 as., ...	1	8	0
—	—	29	Nameless King, A. A. IX. 11, 12, &c. at 1 anna.,..	1	13	0
			ARSACIDAN.			
—	24	—	Various Kings, at 1-8, ...	36	0	0
—	—	8	Ditto Ditto, at 10 as.,........................	5	0	0
—	—	13	Small Copper Coins, various reverses, at $1\frac{1}{2}$ anna.	1	3	6
—	—	27	Ditto, less perfect, at 1 anna., ...	1	11	0
—	—	6	Small Eucratides, at 1 an.,..................	0	6	0
—	—	36	Kadphises, at 1 an.,..........................	2	4	0
—	—	56	Kanerkís, at $1\frac{1}{2}$ an., various reverses, ...	5	4	0
—	—	84	Ooërkís, Elephant, $\frac{1}{2}$ an., ...	2	10	0
„	153	487		653	15	6

Gold.	Silver.	Copper.		Rs.	As.	P.
„	153	487	Brought forward, ...	653	15	6
—	—	58	Ditto, seated figure, $\frac{1}{2}$ an., ...	1	13	0
—	—	211	Miscellaneous Coins, at 1 an., ...	13	3	0
			SASSANIANS.			
—	21	—	Pure Sassanians, various kings, at 1 R.,			
—	3	—	Khúsrúis, at ditto, ...	30	0	0
—	4	—	Indo-Sassanians, at ditto, and *broken* bits, 2 Rs., ...			
—	—	74	Sassanians, *damaged*, ...	2	0	0
—	—	367	Indo-Sassanians of later date (some silver),	6	0	0
			VARÁHAS and INDO-SASSANIAN *lower* types.			
—	8	—	Good selected specimens, ...			
—	29	—	Small Fire Altar Reverses, ...	21	6	0
—	134	—	Miscellaneous mixed specimens; 171 at 2 as., ...			
„	352.	1197		728	5	6
			HINDÚ COINS.			
			Kâbul Kings. Brahmans.			
—	1	—	Khedáva, V. R. See Jour. Roy. As. Soc., Vol. IX. pl. fig. 5, ...	6	0	0
—	7	3	Syalapati's, at 12 as. See Ariana Antiqua. Pl. XIX. fig. 6, &c., ...	7	8	0
—	—	6	4 Vanka Devas, 2 Samantas, Elephant type. See A. A. figs. 11 and 12, pl. XIX., at 12 as., ...	4	8	0
—	47	—	Samanta Déva's, at 8 as. each. A. A. XIX. fig. 1, &c., ...	23	8	0
—	—	34	Rude (Horseman and Hindi Reverse) J. A. S. Bengal, Vol. IV. pl. 36, fig. 11, at 2 as., ...	4	4	0
—	—	4	Selected Coins, one unpublished, in all 4-12,	4	12	0
—	—	10*	Madanpálas, at 6 as. Ariana Antiqua, XIX. 23, ...	3	12	0
—	—	13*	Chahera dévas, at 3 as., A. A. XIX. 16, &c.,	2	7	0
—	—	4*	Ánungapálas, at 8 as., A. A. XIX. 15, &c.,	2	0	0
—	—	3	Malaya Vermás at 8 as., J. A. S. Bengal, Vol. IV. pl. 36, fig. 17, ...	1	8	0
—	—	10	Gobindas, C. at $1\frac{1}{2}$ as., ...	0	15	0
—	—	16	Kutlugh Kháns, at 2 as., A. A. XIX. 38,	2	0	0
—	33	—	Silver Coins of these types, at 4 as., ...	8	4	0
—	—	57*	Billon ditto, at 3 as., ...	10	11	0
—	—	157	Copper Coins, at $\frac{1}{2}$ an., ...	4	14	6
—	—	2*	Madanpálas, at 6 as., ...	0	12	0
„	88.	319		87	11	6

Gold.	Silver.	Copper.		Rs.	As.	P.
,,	88.	319	Brough forward, ...	87	11	6
—	—	1*	Anungapála,..................................	1	0	0
—	—	4*	1 Prithvi Rája, at 6, as., A. A. XIX. 18.—3 Someswáras, at 1 R. each. A. A. XIX. 28, Jour. R. A. S. Vol. IX. pl. fig. 16,	3	6	0
—	—	3	Selected Kangra Coins, at 4 as. each, ...	0	12	0
—	—	10	10 Selected Specimens, at 12 as., ...	7	8	0
—	—	447	Coins of the Kangra Dynasty (unarranged), at 1 an.,..................................	27	15	0
—	—	46	Comprising nine varieties of Coins of the Datta and Mittra families, at 8 as., ...	23	0	0
—	—	59	Coins Miscellaneous, Mittra's, &c. at 8 as.	29	8	0
—	2	—	Silver Ayodhya, at 8 Rs. each, ...	16	0	0
—	—	2	Copper ditto, at 5 each, ...	10	0	0
—	—	26	Copper Miscellaneous, at 6 as., ...	9	12	0
—	—	21	Coins Yandheya, } 44, at 4 as. each,	11	0	0
—	—	23	Coins Behat type, }			
1	—	—	*Skanda* Gúpta, at 20 Rs., ...	20	0	0
1	—	—	*Samudra* very perfect, 60 Rs., ...	60	0	0
5	—	—	Ditto, at 18 Rs. each,........................	90	0	0
6	—	—	5 *Chandra* Gúptas, at 19 each, 1 Kacha, at 20, ...	115	0	0
4	—	—	Kumára Gúptas, at 19 each, ...	76	0	0
1	—	—	Ditto, *cast*, 6 Rs., ...	6	0	0
—	17	—	Saurashtran and Gúpta Coins, at 12 as.,	12	12	0
—	16	—	Gúpta Coins with Peacock Reverse, at 12 as. J. A. S. Bengal, Vol. IV. pl. 49, fig. 10, 11, &c., ...	12	0	0
—	—	4	Copper, at 4 as., ...	1	0	0
2	—	—	Debased Gold *(Electrum)* Coins, Pratapaditya, at 4 Rs.,..........................	8	0	0
—	—	18	Copper ditto, at 2 as.,.........................	2	4	0
15	—	—	15 Gold Kanouj Coins, at 8 Rs. each, ...	120	0	0
—	2	—	2 Silver at 1 R., ...	2	0	0
—	—	2	Copper, at 2 as., ...	0	4	0
5	—	—	Indo-Scythic *Baráno*, at 19 Rs., ...	95	0	0
2	—	—	Kanérkís, *one* very perfect 35 Rs., the *other* 18, ...	53	0	0
1	—	—	Ooérki, 18 Rs., (three Forgeries also),...	18	0	0
3	—	—	Later Gold Coins, at 10 Rs.,................	30	0	0
—	7	—	Silver Hyrkodes, one very perfect, 14 Rs., 6 at 12 as. each, 4-8, ...	18	8	0
—	—	109	Cast Coins, at 1 an. each, ...	6	13	0
—	—	—	Small Coins of the Type depicted in fig. 33, pl. XXXIX. Vol. IV. Jour. A. S. Bengal, (in number 3,479 !)	6	0	0
46	132.	1094		980	1	6

Gold.	Silver.	Copper.		Rs.	As.	P.
46	132	1094	Brought forward,......................	980	1	6
—	373	30	373 Silver punch-marked Coins. J. A. S. B. Vol. IV. pl. 35, figs. 25, 26, &c. The average weight of these coins is about 50 gr., at 5 as. each, ...	116	9	0
			30 Copper, at 1 an.,..............................	1	14	0
13	—	—	13 Small Gold Coins of Nípál—total weight 12 grains, ...	3	0	0
—	11	—	11 Silver Coins, at 1 R. each, ...	11	0	0
—	3	—	3 S. Assam Coins, at 3, ...	9	0	0
—	3	—	3 Ditto, at 1-8, ...	4	8	0
—	30	1	30 Silver and 1 Copper, at 10 as. each,...	19	6	0
—	6	—	Tipperah Coins, at 2-8, ...	15	0	0
—	2	—	Kuch Behar, at ditto, ...	5	0	0
—	8	—	Kuchar, at 14 as., ...	7	0	0
—	4	—	Holkars, at 2-8, ...	10	0	0
—	2	—	Arrakan, at 14 as., ...	1	12	0
—	10	—	Ten Local Rupees, at 1-2, ...	11	4	0
—	—	5	Ceylon Coins, at 10 as., ...	3	2	0
3	—	—	Gold Coins (and two small pieces of Gold), ...	20	0	0
—	2	—	Tippú Sahebs, ...	5	0	0
8	—	—	8 Gold Húns, weight 55 gr. each,.........	36	0	0
—	—	41	41 C. Kashmír Coins, at 3 as. each, ...	7	11	0
—	—	40	40 Ujain Coins, at 10 as. each, ...	25	0	0
—	—	11	6 Satrap and 5 Ariano Páli Coins, at 8 as.,...	5	8	0
—	—	46	Inferior ditto, at 2 as., ...	5	12	0
70	586	1268		1303	7	6

Mohammedan Coins.

The Khalifs.

Gold.	Silver.	Copper.		Rs.	As.	P.
1	—	—	Dated A. H. 157, ...	14	0	0
1	—	—	Small Coin, without date, ...	5	0	0
—	1	—	Struck at الري *Isfáhan*. A. H. 129, ...			
—	3	—	Ditto at المحمدية A. H. 151 and 191, ...			
—	2	—	Ditto *Medinat ul Salám*. A. H. 155 and 192, ...	45	0	0
—	1	—	Mint illegible, dated A. H. 158, ...			
—	1	—	Struck at هرون اباد A. H. 169. V. R. ...			
—	1	—	Ditto Bokhárá. A. H. 194, ...			
			9 Coins, at 5 Rs.			
—	1	—	*Unique*, minted at ايرشهر *Nishápúr*. A. H. 211. On the *Obverse* is the name طلحه, on *Rev.* الطاهري	16	0	0
2	10	0		80	0	0

Gold.	Silver.	Copper		Rs.	As.	P
2	10	0	Brought forward, ...	80	0	0
—	8	—	Miscellaneous Silver Coins of nearly similar types and a number of broken coins,..	12	0	0
			SAMÁNIS.			
1	—	—	Nasr bin Ahmad—Nishápúr. A. H. 324,	12	0	0
1	—	—	Mahmúd of Ghazni—Herát. A. H. 412,	12	0	0
—	1	—	Ditto, ...	1	0	0
—	—	22	Mixed Khalif and Samánis, at 12 as. each,	16	8	0
—	—	4	Broad Coins, Mint illegible, dated A. H. 348 and 349,..................................	2	0	0
—	—	13*	Miscellaneous Ghazni and Ghor Coins, each 6 as.,..................................	4	14	0
—	—	19	Ditto, of various types, at 3 as., ...	3	9	0
—	—	1	1 *Unique* Fire Altar Coin, device composed of Arabic legends curiously arranged to imitate the original design,	20	0	0
—	—	135	Copper Coins chiefly Samánis, at 4 as.,...	33	12	0
			MISCELLANEOUS SILVER COINS.			
—	29	—	Coins of عزالدين كرمان محمود Samarkand ? dated A. H. 761 ? at 10 as.,............	18	2	0
—	2	—	Herát Coins, dated A. H. 751, at 1-8, ...	3	0	0
—	1	—	Il-Khan Bokhára Mint, ...	1	8	0
—	10	—	Sháh-Rókhís, at 9 as.,..........................	5	10	0
—	1	—	A Ghazni Coin of محمد بن طرعاتا ? A. H. 773, ...	3	0	0
—	3	—	1 Abúsáid : 1 Khákán خليل الله A. H. 742 : 1 Abdullah A. H. 945, ...	6	0	0
—	3	—	Two more of a similar class, 2 Rs. One Seljúk Kái Khusrú bin Kái Kobád, 3 Rs...	5	0	0
—	4	—	Miscellaneous Silver Coins, at 8 as.,......	2	0	0
			GHAZNI COINS.			
2	—	—	Mansúr bin Nóh Samánï, struck at Herát, A. H. 360 and 361, ...	24	0	0
—	6	—	Subuktagins, at 1-8,..........................	9	0	0
—	1	—	Ismáil, V. R.	6	0	0
2	—	—	Mahmúd, Herát and Ghazni, at 14, ...	28	0	0
—	2	—	Seif ud dowlat, V. R. 5 : one Unique type 6;	11	0	0
—	12	—	4 Ghazni Mint, A. H. 375, at 12 as. : 8 ordinary, at 8 as., ...	7	0	0
—	18	—	Miscellaneous Silver Coins of Mahmúd, at 6 as., ...	6	12	0
8	111	194		333	11	0

Gold.	Silver.	Copper.		Rs.	As.	P.
8	111	194	Brought forward, ...	333	11	0
2	—	—	Masaud's 1 Ghazni, A. H. 423 at 12; a second at 14, ...	26	0	0
—	3	—	Balkh Coins, at 12 as., ...	2	4	0
1	—	—	Gold Coin, dated A. H. 428,...............	14	0	0
—	2	—	Modúds, at 1-8, ...	3	0	0
—	4	—	Ibrahim's, at 12 as., ...	3	0	0
—	2	—	Behrám Sháhs, at 1-8, ...	3	0	0
—	1	—	Khusrú Shah, ...	2	0	0
—	—	19	Copper Coins, at 2 as. each, ...	2	6	0
1	—	—	Ala-ud-din Muhummad bin Takash, ...	8	0	0
—	2	—	One large and one small Silver Coin, at 3 Rs. and 1-8 each,.........................	4	8	0
—	—	22	Copper Coins, at 5 as., ...	6	14	0
			PATHÁN KINGS OF DELHI.			
1	—	—	Tughlak Sháh, A. H. 721, (wt. 168 gr.)	24	0	0
1	—	—	Muhummad bin Tughlak, A. H. 727, ...	20	0	0
1	—	—	Ditto. New Type, Déogír, A. H. 727, (200 gr.)	50	0	0
—	3	—	Nasir-ud-din Mahmúd, at 2, ...	6	0	0
—	4	—	Balban's, at 3,..................................	12	0	0
—	4	—	Feróz's, at 3, ...	12	0	0
—	5	—	Kaikobáds, at 4, ...	20	0	0
—	1	—	Tughlak Shah, 5,.........	5	0	0
—	1	—	Khusrú unique, but in bad preservation,	50	0	0
—	17	—	Alá-ud-din Mohammed Sháh, at 1-8 each,	25	8	0
—	15	—	Shír Sháhs, at 1-8, ...	22	8	0
—	14	—	Islám Sháhs. One at 5 Rs., the rest at 1-8,	24	8	0
			PATHÁN'S *(Copper.)*			
—	—	64*	Muhummad bin Sám, at $2\frac{1}{2}$ as., }	15	0	0
—	—	32*	Altemsh, at ditto, ... }			
—	—	23*	Masaud Sháh, at 2 as., ...	2	14	0
—	—	61*	Mahmúd, at $1\frac{1}{2}$ as.,..........................	5	11	6
—	—	44*	Balban, at 2 as., ...	5	8	0
—	—	16*	Kái Kobád, at $2\frac{1}{2}$ as., ...	2	8	0
—	—	48*	Feróz Sháh, at 2 as., ...	6	0	0
—	—	102*	Alá-ud-din, at 1 an., ...	6	6	0
—	—	37*	Umbárak Sháh, at 3 as., ...	6	5	0
—	—	44*	Tughlak Sháh, at 3 as., ...	8	4	0
			MUHUMMAD BIN TUGHLAK.			
—	5	—	Debased Silver Coins, at 2 Rs. dated 727, (729,) 730, ...	10	0	0
—	—	2	Rare *Doulutábád* Coins, at 2-8,...........	5	0	0
—	—	5	Varieties of Nos. 104 and 105—" Pathán Kings, Delhi,".............................	5	0	0
—	—	2	Unpublished varieties, at 4, ...	8	0	0
15	194	715		766	11	6

Gold.	Silver.	Copper.		Rs.	As.	P.
15	194	715	Brought forward, ...	766	11	6
—	—	4	Three Hasht-Gánís, at 2 Rs., one Do-Gání, at 5, ...	11	0	0
—	—	55	Selected Coins (many Silver), at 4 as.,...	13	12	0
—	—	23	Ordinary Bronze *(forced currency)*, at 2 as.	2	14	0
—	—	1*	Billon Coin, dated 726, A. H.	0	4	0
—	—	31*	Feróz Sháh, large Coins, at 6 as., ...	11	10	0
—	—	51	Ditto, small ditto, at 2 as.,..................	6	6	0
—	—	11*	Bahlól Lódí, at 5 as., ...	3	7	0
—	—	38	Sekandar bin Bahlól, at 2 as., ...	4	12	0
—	—	37	Shír and Islám Sháhs, at 2 as., ...	4	10	0
			MOGHUL COINS.			
6	—	—	Akber, at 18 Rs.,.............................	108	0	0
5	—	—	Jehángir (Libra, Pisces, Taurus) *four* at 20, one at 18, ...	98	0	0
2 1 1	— — —	— — —	Sháh Jehán, A'urungzéb, Sháh A'lum, } at 17 Rs. each, ...	68	0	0
1	—	—	A small Gold Coin, ...	4	0	0
			MOGHUL SILVER COINS.			
—	51	—	Akber's, at 1-2, ...	57	6	0
—	5	—	Jehángír's, 2 Leo, at 4, 2 Capricornus at 8, one Gemini, 10, ...	34	0	0
—	3	—	Ditto in the name of Núr Jehán Bégum, at 7, ...	21	0	0
— — — — —	24 43 20 7 12	— — — — —	Ordinary Coins of Jehángir, at 1-2,...... Sháh Jehåns, at ditto, ... A'urungzéb's, at ditto, ... Ferókshír's, at ditto,........................ Muhummed Sháh, at do., 106 at 1-2, ...	119	4	0
—	1	—	Morád Buksh, ...	10	0	0
—	18	—	6 Sháh A'lem, 12 Md. Akber 2nd, at 1-1,	19	2	0
—	6	—	Bengal Sultáns, at 2-8, ...	15	0	0
—	—	43	Akber's, &c., at 1 an. each,.................	2	11	0
			MISCELLANEOUS MOHAMMEDAN.			
—	—	30	9 GHAZNAVIS, at 5 as.; 14 curious and rare Coins, at 4 as.; 7 ditto at 6,......	8	15	0
—	—	278	Mixed Coins, at 1 an.,.........................	17	6	0
			THE SÚFI RACE, in Persia.			
—	1	—	ISMAIL SUFI very perfect, ...	12	0	0
—	42	—	Silver Coins various, at 14 as., ...	36	12	0
—	42	—	Silver PERSIAN Coins, Nádíris, &c. at 1-2,	47	4	0
—	8	—	Coins Md. Kajar, at 1-1, ...	8	8	0
—	13	—	Small Coins, at 7 as., ...	5	11	0
—	33	—	Miscellaneous Silver Coins, at 9 as.,......	18	9	0
31	523	1317		1536	14	6

Gold.	Silver.	Copper.		Rs.	As.	P.
31	523	1317	Brought forward, ...	1536	14	6
—	18	—	7 Large and 11 small *Futteh Ali Kajar*, at 1 R. and 6 as., ...	11	2	0
—	80	—	Kabul Rupees, at 15 as., ...	75	0	0
—	—	158*	Billon Coins of Jaunpore Dynasty (*three* Kings) at 2 as., ...	19	12	0
—	6	60	Malwa Coins, six Silver, at 12 as., and about 60 Billon, at 1 an., say 4 Rs.,...	8	8	0
31	627	1535		1651	4	6
			Miscellaneous Coins.			
—	1	—	An Oude Silver piece, wg. 7$\frac{3}{4}$ tolahs, ...	12	0	0
—	16	—	A paper of Miscellaneous Silver Coins, A, at 6 as.,.................................	6	0	0
—	—	43	Copper ditto A, at $\frac{1}{4}$ an., ...	0	10	9
—	4	0	Silver Coins, B, at 2 Rs. each, ...	8	0	0
—	—	19	Copper ditto, B, at 2 as., ...	2	6	0
—	3	—	Silver Coins, C, at 2 Rs., ...	6	0	0
			Some Chinese Cash and other Copper Coins, C, ...	1	0	0
			About a seer (2 lbs.) of worn Copper Coins, at 1-4 per seer,.....................	1	4	0
—	—	236	A bag containing 236 modern Local pysa, at $\frac{1}{4}$,..................................	3	11	0
—	—	12	Twelve selected Coins, at 3 as., and a bag containing six seers, seven chittaks of Copper Coins, at 1-4 per seer, ...	9	4	9
—	132	—	Miscellaneous Rupees, at 1, ...	132	0	0
—	110	—	Smaller Silver Coins, at 3 as., ...	20	10	0
—	11	—	Small S. Coins (in another packet), at 3 as., ...	2	1	0
—	—	4	Sassanian Coins of rare type, at 8 as.,...	2	0	0
			About half a seer of Copper Coins, at 1-4,	0	10	0
—	—	53	Roman *second bronze* Coins, among them some rare types of Agrippa, Plotina, Faustina the Elder and Faustina the Younger, at 1-4 each,.....................	63	4	0
—	—	17	Lower Empire Coins, at 6 as., ...	6	6	0
	277	384		277	3	6

Summary.

	Gold.	Silver.	Copper.	Rs.	As.	Pie.	
Greek, &c.........	...	352	1,197	728	5	6	
Hindu,.............	70	586	1,268	1,303	7	6	
Mohammedan, .	31	627	1,535	1,651	4	6	
Miscellaneous, .	...	277	384	277	3	6	
Total Coins,...	101	1,842	4,384	3,960	5	0	Total Rs.

PROCEEDINGS

OF THE

ASIATIC SOCIETY OF BENGAL,

For May, 1858.

The monthly General Meeting for May was held on the 5th Instant.

The Hon'ble Sir James Colvile, Kt., President, in the Chair.

The proceedings of the March Meeting were read and confirmed, no meeting having been held in April, in consequence of there not being a sufficient number of members present to form a quorum.

Presentations were received—

1. From the Hon'ble the Court of Directors, through the Government of Bengal, two* sets of Photographic drawings of the ancient buildings at Bejapore.

2. From the Maharajah of Burdwan, a collection of stuffed birds and animals, as described by Mr. Blyth in his list, and a block of fossil wood (the last has not yet arrived).

3. From the Government of Bengal through Mr. Under-Secretary Buckland, the 3rd volume of the Reg Veda Sanhita, edited by Dr. Max Müller, and recently published under the patronage of the East India Company.

4. From Roy Lokenauth Bose, Bahadur, Principal Sudder Ameen, 24-Pergunnahs, a copy of his Bengali treatise on the Hindu Religion.

5. From Colonel Abbott a small Indo-Greek sculpture with the following note :—

* The Jummah Musjeed and Ibrahim Roza.

"I have the pleasure to present to the Society a piece of Indo-Greek sculpture, representing a man seated on the earth, the left hand supported on the left knee. The only garments are a pair of short drawers and a species of Hessian boot. The features are nobly developed. It has evidently formed part of the freize of a cornice which has rested upon the head.

"To denote the weight thus supported, the neck is far buried in the bust, and the muscles are swollen in volume. It must have been executed before the Greek taste carried by the Macedonians to Ariana had been greatly impaired by the barbarism around.

"I purchased it when in charge of the Hazara of a native, who had found it in an old Fort of the Yoosufzye at the foot of the Mountains."

6. From the same gentleman a copy of Pantographia. The following note accompanied the Book :

"I have the pleasure to send for deposit in the Library of the Asiatic Society, if approved by the Committee, a volume* which I purchased of a man sent by me into Bokhara and the neighbouring districts to collect coins previous to quitting the Punjaub.

"It is a valuable, I believe, rare, work. But my object in placing it with the Society is to enable any person properly authorized to claim it. It has evidently belonged to the enterprising and sagacious traveller, William Moorcroft.

"It was purchased, so far as I remember, at Cabul. But I could learn from the purchaser no particulars of interest connected with it.

"Should the Volume be not claimed by any authorised person, I make over my interest in it to the Asiatic Society."

7. From R. Cust, Esq., C. S, copies of his Lives of Rama, and of Alexander the Great, *pamphlets.*

8. From Captain R. Maclagan, Principal Roorkee Thomason College, three copies of Dr. Jameison's Report on the Botanical Gardens of the N. W. P.

9. From a gentleman (name unknown) the first 15 volumes of the Irish Academy Transactions.

* The Pantographia, By Fry.

10. From Dr. A. Weber, a copy of the White Yajur Veda, part III.

11. From the Imperial Academy of Sciences and Belles-Lettres at Dijon, through Mr. Oldham, the Memoirs of the Academy, Volumes 1 to 5, Second series, with an Atlas.

12. From Dr. Falconer through Mr. Oldham, a pamphlet on the description of two species of the fossil Mammalian Genus Plagiaulax from Purbeck.

13. From the Geological Society of Dublin through Mr. Oldham, a series of its publications.

A note from Mohamed Hossein Ally Khan, Ex-Ameer of Scinde, conveying his wish to withdraw from the Society, was recorded.

The election of Mr. B. H. Hodgson and Dr. Falconer, as Honorary members of the Society was postponed under rule 6 of the Society's code.

Mr. Sutherland was named for ballot at the next meeting, proposed by Rev. Dr. Kay, and seconded by G. H. Freeling, Esq., C. S.

Communications were received—

From Baboo Radanauth Sikdar, an Abstract of the Meteorological Observations taken at the Surveyor General's Office during the months of October to January last.

2. From Mr. Cope a paper on Inscriptions on the public buildings of Lahore.

The Librarian and Zoological Curator submitted their usual reports for the months of March and April last.

Colonel R. Strachey exhibited a model of the exceedingly ingenious apparatus, designed by Mr. Stokes, Locomotive Superintendent of the E. I. Railway Company, by which the motive power of Locomotive Engines is made applicable to drive paddle-wheels of steamers. Several river-steamers have been built under Mr. Stokes' superintendence, and fitted with locomotive engines on this system, and have been found to answer excellently in practice. Colonel Strachey entered into some explanations as to the mechanical principles involved in this apparatus, illustrating his remarks by a model and some diagrams.

Library.

The Library received the following accessions during the months of March and April last.

Presented.

Rig-Veda-Sanhita together with the Commentary of Sayancharya, edited by Max Müller, Vol. III. 4to. London, 1856.—By the Hon'ble the Court of Directors, through the Government of Bengal.

Selections from the Public Correspondence of the Punjaub Administration, Lahore, Vol. III. No. 4, 4 copies.—By the Punjaub Government.

Ditto from the Records of the Bombay Government, No. XLVI. New Series.—Annual Progress Reports of the Executive Engineers in the southern, central and northern Provinces of the Bombay Presidency in 1856-57.—By the Government of India, Public Works Department.

Tables de la Lune, par P. A. Hensen, *London,* 1857, Royal 4to.—By the Lords Commissioners of the Admiralty.

The Jumma Musjeed at Beejapore, being a Photographic drawing of the Ibrahim Royal.—By the Hon'ble the Court of Directors.

Report of the Results of the Administration of the Salt Department during 1856-57, folio.—By the Government of Bengal.

Die Germanen und die Romer in ihren Bechselverhur, *pamphlet.*—By the Prussian Academy of Sciences at Munich.

The Almanac and Companion for the North Western Provinces and the Punjaub for 1858.—By Mr. W. H. Carey.

Journal Asiatique, Nos. 39 and 40.—By the Royal Asiatic Society of Paris.

A Catalogue of the Bibliotheca Orientalis Sprengeriana.—By Dr. Sprenger.

The Oriental Christian Spectator for January and February, 1858.—By the Editor.

The Oriental Baptist for March and April, 1858.—By the Editor.

The Calcutta Christian Observer for March and April, 1858.—By the Editors.

Abhundlungen der Akademie Historischen Classe, Vol. VI.—By the Academy.

——— der, Philosophe Classe, Vol. VI.—By the same.

Bouverd Tables Astronomiques.—BY THE VENERABLE ARCHDEACON PRATT.

Vividharta Sangraha, Nos. 48 and 46.—BY BABU RAJENDRALAL MITTRA.

Recueil des Actes de L'Académie Imperiale des Sciences, Belles-lettres et arts de Bourdeaux, 3 Trimestre, *Bourdeaux.*—BY THE ACADEMY.

Report of the Director of Public Instruction in the Lower Provinces for the half year ending October 1857, *Calcutta.*—BY THE DIRECTOR OF PUBLIC INSTRUCTION.

Life of Alexander the Great, known in the East as Sikundar, *Agra*, 1854, *pamphlet.*—BY R. CUST, ESQ.

Rama the son of Dásaratha, King of Ajodya, *Agra*, 1854.—BY THE SAME.

Transactions of the Linnean Society, Vol. 22, Part 2.—BY THE SOCIETY.

Journal of the Proceedings of the Linnean Society, Vol. I. No. 4, and Vol. II., Nos. 5 and 6.—BY THE SAME.

List of the Linnean Society.—BY THE SAME.

Address of the President T. Bell, Esq. to the Society.—BY THE SAME.

Mémoires de l'Académie des Sciences, Arts et Belles-lettres de Dijon. Tome I. to V. Second series, 8vo., with an Atlas of Plates, 4to.—BY THE ACADEMY.

Description of two species of the fossil Mammalian Genus Plagialax from Purbeck.—By Dr. H. Falconer, *pamphlet.*—BY THE AUTHOR.

Journal of the Geological Society of Dublin, Vol. II. Parts 2 and 3, Vols. III. to VI. 8vo.—BY THE ACADEMY.

Address at the 3rd and 5th Anniversaries, *pamphlets.*—BY THE SAME.

Journal of the Statistical Society of London, Vol. XXI. Part I.

Selections from the Records of the Madras Government, No. XLVI. Report on Civil Dispensaries for 1856.—BY THE MADRAS GOVERNMENT.

Magnetical Observations made at the Hon'ble East India Company's Magnetical Observatory at Madras, 4to.—BY THE SAME.

Speech of Col. Sykes in the House of Commons on February 18, 1858, on the proposed India Bill, *pamphlet.*—BY THE AUTHOR.

Report on the Revenue Administration of the Lower Provinces for the year 1855-56, *pamphlet.*—BY THE GOVERNMENT OF BENGAL.

Report on the Botanical Gardens of the Government, N. W. Provinces, by Dr. W. Jameson, *Roorkie,* 3 copies, 1855, 4to.—BY THE GOVERNMENT OF THE N. W. PROVINCES.

Pantographia containing accurate copies of all the known alphabets in the world; together with an English explanation of the peculiar force or

power of each letter, to which are added specimens of well authenticated oral languages forming a comprehensive digest of Phonology. By E. Fry, 1799, 8vo.—By Col. Abbott.

Report (35th) Annual of the Parental Academy or Doveton College, *pamphlet*, 1858.—By the Secretary to the Doveton College.

A Treatise on the Mysteries of Hindu Religion in Vernacular, by Babu Lokenauth Bose, *pamphlet*.—By the Author.

Exchanged.

Athenæum for December and January, 1858.

The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science, Nos. 97 and 98.

Annaler der Chemie und Pharmacie, November, 1858.

Purchased.

American Journal of Science and Arts, Vol. XXV. No. 73.

Literary Gazette, Nos. 2135 to 2139.

Annals and Magazine of Natural History, Vol. 1, Nos. 1 and 2, 3rd series, supplementary No. for December, 1857.

Annales des Sciences Naturelles, Tome VII. Nos. 3 and 4.

Description de L'Assique Septentrionale par Abon-obeid-eb-Rekri, 1857, 8vo.

Comptes Rendus, Nos. 23 to 26, December 1857, Nos. 1 to 5, January to 1st February.

Tables Ditto, Tome XLIV. 1857.

Edinburgh Review for January, 1858, No. 217.

Journal des Savants for November, December, 1857, and January, 1858.

Die Orientalischen Münzen des Akademie Münzenbenets in Kongsberg on E. H. F. Neplman, *Liepzig*, 1858.

Revue des Deux Mondes, January and February, 1st and 15th, and 1st March, 1858.

——— et Magasin De Zoology, Nos. 11 and 12, March 1857.

The Natural History Review, Vol. V. No. I. January 1858.

The Quarterly Review, No. 205, January 1858.

Atharva Veda Sanhita von Roth und Whitning, Erste Abth.

Gourdass Bysa'ck,
Librarian and Asstt. Secy.

The Asiatic Society's Rooms,
1st April, 1858.

Report of Curator, Zoological Department, for May, 1858.

1. Dr. G. von Liebeg, having kindly permitted a native collector in the pay of the Society to accompany him, in his recent visit to the new penal settlement at Port Blair, on the eastern coast of the southern island of Great Andaman, I have now much pleasure in reporting on the specimens that were obtained by him and by Dr. Liebeg himself, under circumstances of considerable difficulty.

In the class of mammalia, there are only a human bone and some skulls of the undescribed wild Hog of the Andamans.

The bone is the left femur of probably an adolescent female. Length $14\frac{1}{4}$ in., by $2\frac{5}{8}$ in. in circumference at middle of trunk; the epiphyses imperfectly anchylosed. It is charred throughout; having been found among the smouldering remains of a recently fired village.

On the same occasion were found the following bones of the wild Hog. 1. Skull of an adult boar, wanting the tusks and lower jaw. 2. Lower jaw of a rather larger boar, with the series of teeth complete. 3. Skull of an adult sow, with teeth in lower jaw complete, and the upper series wanting only some of the incisors. 4, 5. Skulls of adolescent sows. 6, 7. Heads wanting lower jaw, of adult sows. 8. Lower jaw of adolescent sow. 9. That of a younger individual. All of these skulls are daubed over with regular stripes of red ochre, and had been hung up as trophies in the huts of the natives.

Sus andamanensis, nobis, *n. s.* Seemingly akin to the S. papuensis of New Guinea, and to Mr. Hodgson's Pigmy Hog of the Nepal sâl-forest, which he terms Porcula salvania. The entire length of the skull of an adult male, from occiput to tip of the upper jaw, is only $10\frac{1}{4}$ in.: breadth at zygomata $4\frac{1}{2}$ in.: palate to tip of intermaxillaries, 6 in.: series of molars six (properly seven, the first having been displaced by the growth of the tusks, which are shewn by the shape of their sockets to have been large and abruptly curved outward and upward); longitudinal diameter of the tusk-sockets $\frac{3}{4}$ in.: series of six grinders $3\frac{1}{4}$ in.: from tusk-socket to tip of intermaxillaries, $1\frac{7}{8}$ in.: breadth of occiput above, where narrowest, 1 in.; and of bony palate, 1 in. The lower jaw of a rather larger male measures $8\frac{3}{8}$ in. to tip of incisors; and height to summit of coronoid process, $3\frac{5}{8}$ in.: the tusks project $1\frac{3}{4}$ in., as in the Indian boar, and are proportionately robust and keen-edged: series of six grinders $3\frac{3}{8}$ in., thence to the tusk 1 in., and midway, a little nearer the tusk, is situate a small præmolar: the hindmost grinder is longer, in its antero-posterior diameter, than the penultimate by only one-half; and in the upper series

the hindmost is scarcely larger than the penultimate. This lower jaw is that of a fully grown boar, whose hindmost molars had long been brought into wear: in the other the hindmost molars are fully developed, but are not abraded.

Of the sow, there are three skulls of fully adults, with the hindmost molars worn; but one only has the lower jaw: in this, the upper plane of the occiput, where narrowest, is only $\frac{1}{2}$ in.; being in the two others $1\frac{1}{8}$ in.: the series of grinders is seven above and below; the tusks small, as in S. INDICUS. In other respects they resemble the boar skull, except in being smaller: length, from occiput to tip of intermaxillaries, $9\frac{1}{2}$ in.; and greatest width, at the zygomata, 4 in.

From the size of the skull of the adult boar, it may be estimated that this animal would not exceed 15 in. in height, if indeed it is even so high at the shoulder. The skull is much less elongated anterior to the orbit than in ordinary Swine, that portion occupying somewhat less than three-fifths of the entire length. Profile a little concave anterior to the eyes, the forehead bulging into a convexity.

It is probable that the same species inhabits the Cocos islets, lying north of the Great Andaman, and also the group of the Nicobars to the south; though on the Great Coco it would appear that Hogs have only been recently introduced by the Burmans, and may therefore be of a domestic race derived from the continent. I have long had reason to suspect that the Hogs of at least the Andaman islands would prove to be of a peculiar species, and therefore called Dr. Liebeg's attention particularly to the subject. The Rev. J. Barbe describes the Nicobar Pigs as being apparently derived from the Chinese, and says nothing of their being of a diminutive size:* moreover they appear to be domesticated; but so, I believe, are a few of the SUS PAPUENSIS in N. Guinea. Proceeding to the south and east, according to Dr. S. Müller, the SUS VITTATUS inhabits Sumátra, with Jáva and Banka; S. VERRUCOSUS also inhabits Jáva; S. BARBATUS, Borneo; S. CELEBENSIS, besides the Babarussa (which is also in Buru and Ternate), Celebes; S. TIMORIENSIS, Timor and Rotti; and S. PAPUENSIS, New Guinea: a goodly series of wild swine, to which we now add the S. ANDAMANENSIS, which needs comparison most with S. PAPUENSIS.

The wild Hogs of the mainland of Asia have not yet been properly determined. They are found at all habitable elevations, and in all climates.

* *J. A. S.* XV, 352. In Mr. H. Busch's 'Journal of a Cruise amongst the Nicobar Islands,' it is remarked that, in Teressa, "the jungle abounds with wild Pigs, which afford the islanders both sport and provisions."

Those of Siberia and Tartary (in the most extended sense of the latter appellation) are probably identical with S. SCROPHA of Europe; perhaps also those of Persia and Afghanistan:* but there would seem to be more than one race in India, to judge from the skulls; and while the ordinary Indian wild Hog is also that of Ceylon, our museum contains a skull from that island which considerably resembles the skull of S. BARBATUS, (as figured by Dr. S. Müller); this is the S. ZEYLONENSIS, nobis, *J. A. S.* XX, 173. The ordinary wild Hog of India is designated S. INDICUS by Gray (being also S. CRISTATUS, Wagler); but the distinctions from S. SCROPHA mentioned by Dr. Gray are not very satisfactory;† and he also indicates a S. AFFINIS from the Nilgiris.‡ The countries eastward are likely to yield some peculiar species, even to the south of China: but the only peculiar Hog as yet properly determined from the whole mainland of Asia is Mr. Hodgson's tiny PORCULA SALVANIA.

Of birds, twelve species were obtained, one of which is a beautiful new *Sháma.*

KITTACINCLA ALBIVENTRIS, nobis, *n. s.* Differs from K. MACROURA, (L.) in its colouring, and in form of tail, the four middle feathers of which extend little beyond the next pair, and the medial pair but $\frac{3}{16}$in. (instead of commonly 2 in., as in the other). Abdominal region, vent, tibial plumes, and inside of the wing anteriorly, pure white, like the upper tail-coverts in both species; the hindmost portion of the flanks, and the lower tail-coverts, only, being deep ferruginous: four pairs of outer tail-feathers more deeply tipped with white than in K. MACROURA: in other respects resembling that species; being a true *Sháma,* as distinguished from a *Dhyal* (COPSYCHUS). Length of wing $3\frac{1}{2}$ in., and of tail $4\frac{1}{4}$ in. A third species of this genus, as distinguished from the nearly affined African genus CERCOTRICHAS, exists in the K. LUZONIENSIS (*Copsychus luzoniensis,* Kittlitz), of the Philippines.

The other species of birds from the Andamans are—

HALCYON COROMANDELIANUS, (Scopoli).

H. SMYRNENSIS, (L.)

CORVUS CULMINATUS, Sykes.

STURNIA ERYTHROPYGIA, nobis. The only specimen has the upper and lower tail-coverts, with the rump and tips of the tail-feathers dull white, instead of deep ferruginous; but there is a faintly perceptible shade of

* Since writing the above, I have been assured of the existence of three most distinct species of wild Hog on the plains of Mesopotamia.

† *Vide Proc. Zool. Soc.* 1852, p. 130.

‡ *List of the Osteological specimens in the Collection of the British Museum.*

the latter, which I doubt not is fully developed in other Andaman examples. Heretofore only known from the Nicobars.

Tephrodornis grisola, nobis. This species we have also from Calcutta, Arakan, Pinang, and Java; so that it has probably been named by the late Professor Temminck.

Geocichla innotata, nobis. Discovered in the Nicobars, and subsequently obtained in Province Wellesley.

Copsychus saularis, (L.) Undistinguishable from Bengal specimens.

Artamus leucorhynchos, (L.) Badly so named; for the bill is of a fine blue.*

Edolius —— ? The Malayan species of *Bhim-ráj*, with rudimentary frontal crest.

Pycnonotus jocosus, (L.) The Burmese and Pinang variety, with shorter and deeper-coloured crimson ear-tufts than in the Indian race.

Carpophaga sylvatica, Tickell (*C. ænea* of India, auctorum, and of Sumatra apud Raffles). Two fine specimens, quite similar to the continental race on either side,—*i. e.* differing from the marked peculiar race of the Nicobars,—C. insularis, nobis.†

In the class of reptiles, a species of Varanus was procured, but circumstances did not permit of its preservation.

In that of fishes, the most remarkable is a curious new genus of the Blenny group, with broad expanded pectorals, thrown out as in the Loches of the genus Homaloptera (apud Bleeker, *Balitora*, Gray, *Platycara*, McClelland):—

Andamia, nobis, *n. g.* Form elongated, with large expanded pectorals and caudal, and a long serrated anal which is also permanently expanded; the ventrals short, even with the pectorals, and consisting each of an outer simple ray and an inner divided ray, which are separated nearly to the base. Head depressed, with rather small eyes, placed vertically, and distantly apart; the mouth opening downward, and furnished with a remarkable labial apparatus: in front it is covered by a thin overflapping upper lip, which is connected laterally by a plicature with a fold or flap of membrane underneath, at a short distance from the mouth behind it: minute marginal teeth in both jaws, which are perceptible to the touch as a slight asperity. Dorsal fin extending the whole length of the back,

* The alleged new Indian species of Artamus, described by Dr. Nicholson in the *Proc. Zool. Soc.* 1851, p. 195, by the name *A. cucullatus*, seems to be no other than Campephaga sykesi, Strickland!

† The Chalcophaps of the Nicobars appears to be Ch. augusta of the late Prince of Canino.

becoming higher on its posterior half; its spinous and soft rays not easily distinguishable, and the second and third rays are a little elongated in the males (at least of the species described, which also has a small palmated appendage over each eye).

A. EXPANSA, nobis, *n. s.*

D. 36.—*V.* 26.—*P.* 14.—*C.* 11.

Colour dark plumbeous above, with slight pale mottled transverse bands on the sides: the gill-covers studded with minute dusky specks: dorsal fin dusky; the ventral surface and anal fin whitish, with a dark spot on each ray of the latter: membrane of the tail colourless, with conspicuous black rays; the caudal rays extending beyond the membrane: the tail having a rounded form, and being almost continuous below with the anal fin. In a young individual, the dorsal fin is pale, with the exception of the first two rays, which are black. In adults the pectorals and posterior half of the dorsal are marked (more or less distinctly) like the caudal, black rays on colourless membrane: ventrals pale. Length $3\frac{5}{8}$ in.

SALARIAS OLIVACEUS, nobis, *n. s.* One of the crested species of this genus, having also a small appendage over each eye.

D. 12-19.—*V.* 22.—*P.* 13.—*C.* 12.

General colour dark olive-green, paler below, and also on the hinder half of the body, where inclining to dull reddish: a few obscure dark spots along the back, at base of the dorsal fin, not visible in all specimens, and some minute black specks also towards the tail. Length $3\frac{1}{4}$ in.

PERIOPTHALMUS FUSCATUS, nobis, *n. s.* Pectorals rather large: ventrals deeply divided: anterior dorsal moderately high, with no elongated filaments: caudal pointed, and as if obliquely truncated below.

D. 12-13.—*V.* 11.—*P.* 11.—*C.* 17.

Colour dusky leaden-brown above, obscurely mottled; the lower-parts pale: the two dorsal and the caudal fins speckled with black; the pectorals less distinctly so; and the ventrals and anal spotless: on the gill-covers are a few white specks; and the sides of the body are obscurely marked with numerous small black spots. Length $3\frac{1}{4}$ in.*

GOBIUS BREVICEPS, nobis, *n. s.* A small nude-headed Goby, with the eyes placed remarkably forward, imparting somewhat of a *feline* aspect to the visage. Fins ordinary, or presenting no peculiar character.

D. 6.—1-9.—*A.* 1-8.

Colour a pale red-brown, with a row of large blackish spots along the

* We have a small PERIOPTHALMUS from Mergui, which, in its colouring, approximates the P. ARGENTILINEATUS, C. and V., but has merely a slight infuscation of the first dorsal. *D.* 9-13.—*V.* 12. If distinct, P. SCINTILLANS, nobis.

side from pectoral to caudal, tending rarely to form a continuous band, above which the back is irregularly freckled with dusky specks of different sizes: the two dorsal and the caudal fins are also minutely speckled with dusky; the other fins and the lower-parts pale and spotless. The largest of several specimens measures $1\frac{7}{8}$ in.

G. CORYPHÆNULA, Valenciennes. This curiously formed species appears to be very common both at the Andamans and Nicobars, frequenting the coral-reefs.

APOGON QUINQUEVITTATUS, nobis, *n. s.* About 1 in. in length, with four vertical black bands, a fifth at base of tail, and the occipital region also of this colour. Form compressed; the mouth small; scales also small, numbering about 24 to end of lateral line, which terminates at the posterior base of the second dorsal fin, and 3 rows above and 10 below the lateral line, downward from the first dorsal. Eye large, occupying two-fifths of the vertical height of the head.

D. 13—10.—*A.* 3-9.—*P.* 15 (?).—*V.* 5.

Pectorals reaching beyond the second lateral band; the posterior dorsal and the anal fins projecting similarly as far as the base of the tail-fin.

MICROPHIS TENUIS, nobis, *n. s.* A very slender *Syngnathous* fish, with 16 body and 36 caudal rings, and dorsal fin upon the first 7 caudal rings.

D. 24?—*P.* 16?—C. 9?

Snout half the length of the head, and scarcely more compressed than the neck; body slightly heptangular, the two dorsal angles alone strongly marked; tail quadrangular, and nearly twice as long as the head and body. Dorsal aspect unmottled brown; the other facets of the body (between the angles) marked, more or less distinctly, each with a white band, the continuity of which is broken at the rings: on the tail similar markings are but slightly indicated: no silvery appearance at the gill-covers. Described from two female specimens, the longer of which measures nearly 4 in.

Of *Mollusca*, 22 marine species were procured; but all of them are well known kinds, common in the Bay, and which need not therefore be enumerated.

Among the *Crustacea* are five specimens of a magnificent land-Crab, which sufficiently agrees with the description of CARDISOMA CARNIFEX, (Herbst.), by Milne Edwards; but which are nevertheless probably distinct and new, as no land-Crabs approaching them in size seem to be known on the peninsula of India. There are two marked varieties (one of them probably the result of former mutilation of a claw), each attaining to above 3 in. across the carapace. In one of these varieties the claws of the male are excessively unequal, and the huge nippers of the great

claw (which in three specimens sent is on the dexter side) are armed at the middle (typically) each with an enormous tooth. In the other variety the claws are unequal in the male (the left being rather the larger in the specimen sent), and quite equal in the female,—in both sexes much exceeding in size the small claw of the male of the other variety. There is also a marked difference in the colouring of the claws; those of the second variety being weaker in hue,—whence not improbably the whole difference may depend on the latter having cast and renewed the organ. In GELASIMUS and other Crabs with very unequal claws, the big one is as often on the right side as on the left. From the size and seeming abundance of this fine land-Crab, it is probably much eaten by the Andamaners.

A fresh-water species sent is the female of a new genus akin to VARUNA, remarkable for the small size and nearly round form of the last articulation to the tail, which is placed within a notch of the penultimate articulation, that accordingly half surrounds it, and is the largest of the series.

Other species of Crabs sent are a new ZOZYMUS (since received also from Ceylon), ERIPHIA TUBERCULATA, nobis, *n. s.* (common on the Burmese coasts), TRAPEZA FERRUGINEA (? Latr.), PILUMNUS VESPERTILIO, GRAPSUS STRIGOSUS, GR. MESSOR, SESARMA TETRAGONA, CÆNOBITA RUGOSA, C. ——, a PAGURUS, and GONODACTYLUS CHIRAGRA of the SQUILLA group.

A species of Scorpion and SCOLOPENDRA MORSITANS are also sent; and of *Radiata* a species of COMATULA, two of OPHIOCOMA, one of ECHINUS, a HOLOTHURIA, and a SIRINX (?). Several interesting forms likewise of *Annelides.*

2. E. F. Kelaart, Esq., M. D., Trincomali. To this gentleman we are indebted for a very interesting series of marine Crabs, amounting to 15 species, with specimens of OPHIOCOMA, OPHIURA, URASTER, ASTERINA, &c. Also a FILARIA from the ovaries of the Pearl Oyster.

3. I have next to announce the presentation of a large collection of stuffed specimens, from his highness the Máharája of Burdwan. This collection contains numerous duplicates, and some very acceptable specimens—especially one or more undescribed species of mammalia, so far as I have been able to discover.

Of *Quadrumana*, adult male and female of the Mandrill (PAPIO MAIMON), and a young male of the Drill (P. LEUCOPHÆUS),—well set up: a Monkey, also, which I take to be the INUUS ASSAMENSIS (v. *pelops*); and other species with which we have long been well supplied. Two kinds of Lemur are sent; one the L. ALBIFRONS, Geoffroy; and the other is probably—

L. FLAVIVENTER, Lesson (*Rev. Zool.* &c., 1851, p. 24). In this case, however, the remarkable colouring of the face is unnoticed by its describer. The face and between the eyes are black; but the broad bilobate band above the eyes of L. NIGRIFRONS, is in the present species grizzled with fulvous-white, vaguely divided by blackish along the middle, and the latter continued as a more distinct black line from the vertex to the occiput; the periphery also of the greyish frontal band is dusky-black. Fur more dense and frizzled than in L. NIGRIFRONS, especially upon the head: of a nearly uniform dull grizzled fulvous-brown on the upper-parts, limbs, and tail; palest on the limbs, but darker towards the anterior hands, and the digits light fulvescent: below dull fulvescent-white, purer white on the chin and throat, and passing to deeper fulvous towards the tail, and likewise on the fore-limbs towards the palms; some pale colour also on the cheeks, and the fur upon the ears; and the moustachial bristles black. Size rather exceeding that of L. NIGRIFRONS and L. ALBIFRONS.*

A species of PARADOXURUS would seem to be P. LANIGER, Hodgson; but with the woolly fur much shorter (as produced in confinement), only ½ in. long upon the body, and *Lemurine* or Bat-like in character, close and frizzled: but the relative proportions of the tail and body do not agree, this having the tail about equalling in length the head and body; whereas in P. LANIGER it is described to be "barely more than a third of the entire dimensions." The prevailing colour of the fur is a maronne-brown, grizzled with hoary tips; darker on the head, occiput, cheeks, and ears; and a narrow median white line along the nose: paws also darker, especially those of the hind-feet, and the terminal third or more of the tail: lower-parts whitish, passing up the sides of the neck so as almost to form a collar: the whiskers long and black: ears naked within, and nearly so for the terminal half externally: no dark lines along the back; but a vague appearance of a broadish fulvous streak along the middle of the back. Length about 32 in., of which the tail is half (or very nearly so): head 4 in.; and hind-feet from heel, 2¾ in.

Here may likewise be noticed—

P. LEUCOTIS, nobis (Horsfield's Catalogue). Length about 3 ft., of

* We have now the following species of this genus:

1. L. MACACO, L.: the Ruffed Lemur.
2. L. CATTA, L. The Ring-tailed Lemur.
3. L. NIGER, L. The Black Lemur.
4. L. ALBIFRONS, Geoffroy. The White-fronted Lemur.
5. L. NIGRIFRONS, Geoffroy. The Black-fronted Lemur, with skeleton.
6. L. FLAVIVENTER (?), Lesson. The Grey-fronted Lemur.

which the tail is half. Fur dense and woolly at base, but with long straight hairs intermixed: the prevailing colour pale dull yellowish or fulvous-brown, with three blackish dorsal streaks; below paler, more or less albescent: a white streak on the nose to between the eyes; and the ears black at base, with the terminal half flesh-coloured and scantily furnished with white hairs: crown more or less dusky, grizzled with whitish; and the paws and terminal half (or nearly so) of the tail blackish. Whiskers long and black. Inhabits the Burmese countries (Arakan, Tenasserim, &c.); and is said to be found likewise in Sylhet.

P. RUBIDUS, nobis, *n. s.* A large species, of a prevailing deep maronne colour, with black paws and terminal third of tail; the nape also blackish: no dorsal stripes or spots: a whitish band across forehead, extending broadly in front of the ears; and a duller white streak upon the nose, passing to pale ruddy on the forehead: ears black externally: whiskers conspicuously white: lower parts paler; but the fore-part and sides of the neck blackish, with a pale lateral streak continued downward from the white in front of the ears. Fur rather coarse, obscurely grizzled, with dusky-grey woolly pile at base. Entire length about 44 in., of which the tail is 18 in.: hind-foot from heel $3\frac{1}{2}$ in. A broad pure white tail-tip in the specimen, which was purchased already stuffed; the individual having its nape much abraded from being tied up when alive. *Hab.* —— ?*

Among the mammalia sent by the Máharája of Burdwán, are a stuffed Tiger, 8 Leopards, and 9 Bears, an albino Jackal,† 2 Ratels, ARCTONYX COLLARIS, numerous TRAGULI (or 'Mouse Deer'), with various others unnecessary to particularise, and 5 species of Kangaroo, three of which are new to our museum, *viz.* HETEROPUS PENICILLATUS, BETTONGIA PENI-

* Of this genus we have now 8 species, counting MUSANGA and *typus* as one, and excluding the DERBIANUS as not properly appertaining to it.

1. P. RUBIDUS, nobis, *ut supra.* *Hab.* —— ?

2. P. GRAYII, Bennett: *P. nipalensis*, Hodgson. *Hab.* Himaláya, and mountains of Arakan. One specimen from the latter locality has the entire tail fulvous-white.

3. P. LANIGER (?), Hodgson, *ut supra.* *Hab.* Himalaya?

4. P. LEUCOMYSTAX, Gray: *Amblyodon auratus*, Jourdain. Hab. Malayan peninsula, &c.

5. P. ZEYLONICUS, (Schreber). *Hab.* Ceylon.

6. P. LEUCOTIS, nobis, *ut supra.* *Hab.* Burmese countries.

7. P. TRIVIRGATUS, Reinwardt. HAB. Malayan peninsula, &c.

8. P. MUSANGA, (Marsden): *P. typus*, F. Cuv. *Hab.* India, Burma, and Malay countries.

† We have specimens of the Jackal in the museum,—pure white, coal-black, and bright rufous.

CILLATA, and a large species of LAGORCHESTES, which cannot be identified with any one of the four described by Mr. Waterhouse.

L. GYMNOTIS, nobis, *n. s.* Most nearly akin to L. CONSPICILLATUS, Gould; but much larger, a stuffed female measuring about $2\frac{1}{2}$ ft. from nose to base of tail, and the tail 16 in.: the skin may be distended; but the following admeasurements can be better depended on: ears externally $1\frac{3}{4}$ in. (more when fresh); palm to tip of middle claw $1\frac{7}{8}$ in., the claw $\frac{1}{2}$ in.; tarse to tip of longest claw $5\frac{3}{4}$ in., the claw 1 in.; from muzzle to base of ear $4\frac{1}{2}$ in. Muzzle as in L. CONSPICILLATUS: ears naked within. Prevailing hue rufous-brown, grizzled with dull white; each hair white towards the end, with a black tip: limbs more rufescent: under-parts dull rufescent-white throughout: from the mouth proceeds a dark chocolate-brown line or ill-defined band, contrasting with the white of the throat; and a similar vague band passes from the nostril to the eye, which latter is surrounded with dark hairs: chin also dark: the hairs of the tail are excessively abraded in the specimen, save chiefly a median line underneath; and they seem naturally to be very short, and scanty above and laterally: there is an exceedingly slight indication upon the haunches of the pale band of L. CONSPICILLATUS. *Hab.* —— ?*

Of the specimens of TRAGULUS (or 'Mouse Deer') under examination, four (if not five) species are distinguishable,—in addition to the MEMINNA INDICA.

1. TRAGULUS KANCHIL, (Raffles); of which *Moschus fulviventer*, Gray, is a common variety. This is by far the most abundant species, and its range of distribution extends northward into the Tenasserim provinces. Fourteen specimens are before me, besides an albino. It is constantly dis-

* The Society's museum now contains the following species of MACROPODIDÆ.

1. MACROPUS GIGANTEUS, (Zimmerman). Young male, and skeleton of the same; with skull of an older individual.

2. LAGORCHESTES GYMNOTIS, nobis, *ut supra.*

3. HALMATURUS RUFICOLLIS, (Desmarest). Adult male and female, skeleton of latter, and skull of a younger specimen.

4. H. BENNETTII, Waterhouse. Adult male and female, with skeletons, and skull of a younger individual.

5. H. UALABATUS, (Lesson and Garnot). Stuffed male, and skull.

6. H. DERBIANUS, Gray. Stuffed male and female.

7. H. BILLARDIERI, (Desmarest). Skeleton, with skin of head and neck.

8. HETEROPUS PENICILLATUS, (Gray), *ut supra.* Stuffed female.

9. BETTONGIA PENICILLATA, Gray, *ut supra.* Male.

10. B. CUNICULUS, Ogilby. Skull only.

tinguished from all the rest by the median dark line between the fore-legs: neck rufous, with a median dark nape-band strongly defined. A rufous hue commonly pervades the entire lower-parts, with the exception of the white on either side of the pectoral line; and this white with its medial dark streak extends more or less backward, in proportion as another white streak is continued forward on each side of the belly from behind.

2. TR. PELANDOC (?); *Moschus pelandoc (?)*, Ham. Smith: *Tr. affinis (?)*, Gray. This species accords better than any other with Buffon's figure of *le Chevrotain de Java.* It is smaller than the Kanchil, with a conspicuously shorter head and larger eye: also smaller accessory or succentorial hoofs. The head and neck are very differently coloured; and the hue of the body is more uniformly rufous and much less nigrescent than in the Kanchil, each hair, however, being black-tipped. Head of adult male from base of ear to muzzle $3\frac{1}{2}$ in.; from eye to muzzle $1\frac{3}{4}$ in.: the corresponding dimensions in an adult male Kanchil being $3\frac{7}{8}$ in. and $2\frac{1}{8}$. in.: from hock to point of succentorial hoof $3\frac{3}{8}$ in. in the present species, $3\frac{5}{8}$ in. in the Kanchil. Head rufous, with a strongly marked dark patch on centre of forehead, contrasting much with the broad rufous superciliary mark; but the black of the forehead faintly continued as a nape-streak, whereas in the Kanchil the contrast of the same colours is transferred to the nape. In our present species, the throat is white, continued into three stripes down the front of the neck, which alike terminate in a pale fulvescent cross-band: the rest of the under-parts white, with merely a fulvous tinge on centre of belly: back and sides of the neck, with the two dark bands in front which alternate with the three white ones, of a peculiar *and similar* grizzled colouring, contrasting much with the rufous of the body; the former being constantly rufous, and the latter more or less nigrescent, in the Kanchil: tail bright rufous above, white below and at the tip: limbs also bright rufous. Tusk protruding about $\frac{9}{16}$ in. in the specimen described.

3. TR. JAVANICUS, (Pallas). An adult male and female which I refer to this species, as described by Dr. J. E. Gray in the *Proc. Zool. Soc.* for 1836, p. 64, are remarkable (more especially the female) for the blackish hue of the whole neck, and of the two dark streaks alternating with the three white ones in front of it. General colour rufous, the black tips to the hairs shewing much; the breast, and towards the hind-legs, white, separated by fulvous which occupies the medial region of the belly, extending quite across it. From hock to point of succentorial hoof 4 in.

4. TR. JAVANICUS, var. STANLEYANUS; *Moschus Stanleyanus*, Gray, *P. Z. S.* 1836, p. 65. I take this to be merely a variety of the last, having

the neck, and the marks in front of it, bright chesnut-rufous. The general colouring also is less nigrescent; and one female has a strongly defined dark line from eye to nose, and another along middle of nose, separated by a contrasting pale space. A male and two females are before me.

5. TR. FUSCATUS, nobis, *n. s.*: *Meminna malaccensis* (?), Gray, *Brit. Mus. Catal.* Larger than TR. JAVANICUS; an adult female measuring, from hock to point of succentorial hoof, $4\frac{1}{2}$ in. General hue whitish, with prevailing dusky tips to the fur: beneath wholly white: neck of the same hue as the body, but with a dark nape-streak commencing from the forehead, and the usual white markings in front, alternating with the two dark ones, which are broad and nigrescent. Perhaps a third variety of the JAVANICUS; but, if so, a very distinct one. *Hab.* —— ?

The second species, however, which I have doubtfully assigned to TR. PELANDOC, is most assuredly no variety of the Kanchil; and I do not in the least hesitate to regard it as a well characterized species.

The birds comprise numerous Lories, Cockatoos, and other Parrots; of which the following are new to the Society's museum. EOLOPHUS PHILIPPINARAM, (Gm.), LORIUS CYANAUCHEN, Muller,* and CHALCOPSITTA NOVÆ GUINEÆ: also 2 Emeus, 3 Swans, 3 *Sárás* Cranes, a couple of white Crows, a white (or rather *lutino*) 'Hurrial' or fruit-Pigeon (OSMOTRERON BICINCTA), sundry *Gallinaceæ*, and others which need not be particularized: the only novelty being two specimens (old and young, in very bad condition,) of the PHAPS HISTRIONICA, (Gould). The following Australian species are, however, worthy of notice, as having evi-

* SYN. L. *superbus*, Fraser; but the L. LORY, (L., *v. tricolor*, Stephens,) is subject to so much variation, that I have great doubt if the present bird is more than an occasional variety of it. The principal difference is, that this is blue under the wing (brighter than in L. DOMICELLUS), whereas L. LORY is usually red under the wing: there is also an unusual amount of red up the back, and the blue of the hind-part of the neck is particularly brilliant; but the latter varies much in brightness in different specimens of L. LORY, as do also the relative proportions of the blue and red both above and below,—some having nearly the whole under-parts blackish-blue, passing to vivid prussian-blue posteriorly, and others being crimson as far back as the thighs, with various intermediate phases. This particular specimen of CYANAUCHEN has lost many of its upper nape-feathers, so that it cannot be ascertained whether the usual red occipital band had been present; but I observe that some of the black feathers of the hindmost part of the cap are partly red at base. I repeat my doubt that it is more than an occasional variety of L. LORY.

dently been set up from cage specimens brought alive to this country—PTILINORHYNCHUS COOKII and ENTOMYZA CYANOTIS.*

The reptiles are CROCODILUS PALUSTRIS and GAVIALIS GANGETICUS.

While describing new or little known birds, I may here bring to notice a Pheasant, of remarkable beauty, four living specimens of which (all males) have recently been obtained by Babu Rajendra Mállika for his

* The following, if not the EOS RICINIATA or E. SEMILARVATA, Bonap., descriptions of which I have not seen, would appear to be a new species of Lory.

EOS FUSCATA, nobis, *n. s.* (?) Structure typical. Length of closed wing 6 in. Prevalent colour brown-black, the rump-feathers marginal with dull-white, those of the nape with ruddy-brown, and of the breast with bluish-grey : a dull orange band across the crown, from eye to eye, perhaps typically crimson, a crimson band crossing the upper and another crossing the lower part of the breast ; the abdominal and tibial feathers also crimson, and the flanks and lower tail-coverts dull purple-black : tertiaries ruddy-brown, perhaps brighter in fine specimens : a large ruddy-yellow spot on the inner web of each primary, as seen from above in the spread wing ; and the unspread tail dull ruddy-brown above, with a shade of blue at tip, all but its middle feathers having the inner web crimson to near the tip : under surface of the wings chiefly yellowish-red. HAB. —— ?

TRICHOGLOSSUS OCHREOCEPHALUS, nobis, *n. s.* Size and structure of TR. CHLOROLEPIDOTUS, (Kuhl). Upper-parts uniformly vivid green ; the lower yellowish, passing on the belly and flanks to pure yellow with green tips : crown, ear-coverts, and cheeks, ochreous-yellow, streaked : a broad pure yellow band on the under-surface of the wing, on the inner webs of the primaries and secondaries. Length of closed wing 5 in. HAB. —— ?

The following is perhaps but a cage variety of TR. HÆMATODUS, (L.) ; unless that the tail is more developed, attaining to 5 in. and upwards. The red of the breast and beneath the wing in HÆMATODUS is replaced by glowing yellow, faintly tinged with red towards the centres of most of the feathers : a slight admixture of red also on the axillaries and on the under-surface of the wing : pectoral feathers without dark margins, or with obscure traces of green terminal edges, chiefly towards the flanks : abdominal patch green, with very slight admixture of blue : the blue of the forehead and cheeks dull and little extended ; and the occiput green, above the greenish-yellow nape-band : no yellow at base of inter-scapularies, abruptly defined, as red in HÆMATODUS. Perhaps a distinct species,—the TR. FORSTENI, Bonap. ? The next is certainly distinct.

TR. IMMARGINATUS, nobis, *n. s.* Smaller than HÆMATODUS, the feet conspicuously so. Length of wing 5 in., and of tail 4 in. Crimson of the breast and beneath the wing much brighter than in TR. HÆMATODUS, and little or no trace of dark terminal margins : nape-feathers with fuscous tips, below which a few feathers are red at base, but shewing less than in HÆMATODUS ; great abdominal

aviaries. *Habitat* unknown.* It appears to constitute a second species of the genus DIARDIGALLUS of the late Prince of Canino; but still is closely akin to GALLOPHASIS, Hodgson, and NYCTHEMERUS, Swainson.

D. FASCIOLATUS, nobis, *n. s.* Size of a Jungle-fowl; and the tail well arched, as in typical GALLUS: papillose crimson skin of the cheeks greatly developed, as in the common Silver Pheasant (GALLOPHASIS NYCTHEMERUS), rising on either side into a distinct lappet over the forehead, but not uniting medially to form a comb; also continued downward into well marked incipient wattles, and backward into a peak above the ears. From the crown of the head a most elegant Peafowl-like crest, composed of feathers 3 in. long, the slender black stems of which are quite bare for 2 in., and then each divides and subdivides in a remarkable manner, together forming an acute triangular barbed tip, truncate at the extremity, and of a steel-blue colour. Crown black, passing downward into minutely vermiculated feathers on the neck, fore-part of the back, and breast; the vermiculation less distinct upon the last, which appears of a somewhat dark blended ash-colour: belly, flanks, and tibial plumes, black, the feathers of the flanks tipped with steel-blue: scapularies and wings like the back, but more coarsely vermiculated, each feather terminating in a transverse black band, with narrow whitish margin above, broadest on the scapularies: the great alars, tertiaries, and largest range of wing-coverts, are not thus tipped, but are vermiculated like the inter-scapularies: across the back, above the rump, a shining coppery-golden band; and the rump and upper tail-coverts black, tipped with shining steel-blue, and finally with very rich shining maronne-red: legs bright vermillion, the shank well spurred; and the bill dull waxy-greenish. Irides reddish-hazel. Length of tarse $3\frac{1}{4}$ in.; of bill to gape $1\frac{1}{4}$ in., and anterior to nostril $\frac{3}{4}$ in.: closed wing 9 in., or somewhat less. Female unknown. The figure of the living bird is particularly gracile and *game*-looking; and the bright carmine legs are a conspicuous feature, also the handsome crest, and great development of the papillose naked skin of the cheeks, continued downward into wattles, which are more distinct than in the NYCTHEMERUS.

patch dusky-purple: blue of the forehead and cheeks less developed than in the other.

These various Lorikeets are not uncommonly brought alive to Calcutta; but much less numerously than TR. ORNATUS, the range of which extends eastward to Celebes,—certainly, however, not to Sumatra, as stated by Raffles.

* Since writing the above, I have seen another in the possession of a gentleman, who has reason to believe that it is from Borneo.—All are now dead.

4. A small collection from Major Berdmore, sent by him from the Sitang valley, Pegu. It consists chiefly of species previously forwarded by that officer; though several of them are still highly acceptable. Of mammalia, RHINOLOPHUS AFFINIS, Horsfield,—SOREX FULIGINOSUS, nobis (*J. A. S.* XXIV, 362), and SCIUROPTERA SAGITTA *apud nos* (*J. A. S.* XXIII, 731). Of birds, a fine pair of BUCEROS CAVATUS. Of reptiles and fishes, a few known species, including a small MASTACEMBALUS 4 in. in length, which seems to be M. UNICOLOR, K. and V. H., but with 37 dorsal spines (instead of 34), and a row of black spots along the soft dorsal and more obscurely along the anal.* Also a few crustacea and some good insects.†

We have another MASTACEMBALUS from Maulmein, which seems to be undescribed, and may therefore be designated—

M. ZEBRINUS, nobis. Tail detached from the dorsal and anal fins, as in the common M. PANCALUS of Bengal. Series of 28 or 29 dorsal spines. Colour pale brown, deeper along the back; and marked throughout (more distinctly in the young) with dusky transverse stripes, alternating with fainter stripes more or less regular, which latter are often double or more or less divided, and are set off by the narrow pale interspaces,—much as in the 'Dauw' or *original* Zebra (EQUUS BURCHELLII). In the larger specimens the stripes are more or less obsolete, except towards the tail. Dorsal and caudal fins minutely striated; the anal with broad stripes, as on the sides. Our largest specimen, apparently full grown from its bulk, is $8\frac{1}{2}$ in. in length.

We have also a small *Siluroid* fish from the same locality, which appears to be new both as regards genus and species.

AMBLYCEPS, nobis, *n. g.* Affined to OLYRA,‡ McClelland, but the head much broader and flatter, with minute eyes, placed near the hind aperture of the nostrils: two pairs of cirri above and below, the inner above situate between the fore and hind apertures of the nostrils: pectoral and dorsal spines short and concealed, but comparatively robust: the second or adipose dorsal short and low; and the ventrals and anal also short: tail large and moderately furcate: a band of card-like teeth above and

* The EMYS formerly sent by Major Berdmore, and referred to E. OCELLATA, Dumeril and Bibron (*J. A. S.* XXII, 645), proves to be totally distinct from the latter, of which I have lately obtained two living specimens in the Calcutta bazar. The Burmese Terrapin may therefore now bear the name E. BERDMOREI, nobis.

† Another, $9\frac{1}{2}$ in. long, since received, has 36 dorsal spines, including the comparatively large one immediately anterior to the soft-rayed dorsal.

‡ This name is pre-occupied in Botany.

below, but no palatal band discernible in the specimen: body subcylindrical, compressed, becoming more so to the tail.

AMB. CÆCUTIENS, nobis, *n. s.* Head broader than the body, flat, obtuse at the muzzle; the mouth moderate, its cleft scarcely continued back laterally: cirri large; the upper labial cirrus reaching to tip of pectoral fin, and the exterior lower one nearly as long. Body long and COBITIS-like. The number of fin-rays is difficult to determine, but seems to be

D. 1-6.—P. 1-2 or 3.—V. 6.—A. 6.

Colour dark brown above, paler beneath. Length of specimen 3 in. To describe this little mud-fish properly, a series of specimens are required, or the sacrifice of our only individual. It will, however, be readily identifiable from the above notice. The individual described was procured by Mr. W. Theobald, Junr., at Maulmein; and others, but in much injured condition, have since been received from Pegu, from Major Berdmore.

Although I have attended pretty regularly the Calcutta fish-bazars during the last year, and have procured many good specimens, and added largely to our collection of fish-skeletons, the only species new to the museum which have been obtained are SERRANUS LANCEOLATUS, C. and V. (small), GERRES POETÆ, C. and V., and OTOLITHUS MACULATUS, C. and V. (four individuals).* I have procured, however, a fine series of a somewhat rare fish which is perhaps the CHRYSOPHRYS LONGISPINIS, C. and V., apud Bleeker, from Calcutta; but the dentition of which differs altogether from that of CHRYSOPHRYS, there being no palatal teeth, but only a band of "card-like" teeth in each jaw, with reverted tips, especially those in the upper jaw in front, which are much curved backwards. Now the teeth of CHR. LONGISPINIS are described in the *Hist. des Poissons* to be "small, and disposed in three ranges." Our species otherwise approximates the CHR. CALAMARA (Russell, pl. 92), but is less deep in the body, the eye is larger and is situate higher in the head, which last is throughout covered with small indistinct scales. Pre-operculum minutely toothed; mouth slightly protrusile. The dorsal spines are alternately stouter and more slender, as in Rüppell's figure of CHRYSOPHRYS SARBA, and also in DATNIA and DATNIOIDES, Bleeker (founded on the *Coius polota* of Buchanan Hamilton).†

* Add MESOPRION RANGUS, C. and V.; July 2nd: and since GERRES FILAMENTOSUS.

† Is not this, however, an ANOPLUS of Temminck and Schlegel? Vide *Fauna Japonica*, which I have not seen.

D. 12-14.—*A.* 3-8.—*P.* 18.—*V.* 1-5.—*C.* 1-16.

The first dorsal spine is short, about half the length of the second, which is two-fifths that of the third, which nearly equals the fourth and longest: thence the spinous portion of the fin slopes gradually backward; and the soft portion is as high as the seventh spine and nearly even. The first anal spine is short, the second long and robust and much flattened, and the third one-sixth shorter than the second and much less robust. Ventral spine longer and more slender than the third anal. Pectorals pointed, their tips reaching to the vent. Ventrals also pointed, terminating in a slight filament. Tail scarcely furcate. Scales of the body somewhat large, especially below the lateral line; numbering about 20 in oblique series descending from the first dorsal spine: those composing the lateral line are about 50 in number.

Colour bright silvery, with a pink iridescence along the back and above the eyes; the membrane of the dorsal fin spotted with dusky, becoming nearly or quite obsolete in large individuals. Rest of the fins white, the tail slightly suffused with dusky towards its tip. Irides white with brilliant nacreous lustre. Our largest specimen measures 17½ in. in length, with longest dorsal spine 2¾ in. In small specimens (3 in. long), about 9 or 10 transverse bands are faintly discernible on the body, traces of which appear in larger individuals, broken up into spots more or less obscure. As seen on a fish-stall, the brilliancy of the silvery hue of this species attracts attention even from a distance, considerably surpassing that of the common Datnia argentea, and equalling that of the rarer Gerres poetæ. Should both genus and species prove new, as I suspect, this fish may be named Polotus nitidus, nobis.

The *Siluroid* fishes have engaged my particular attention; but the following species only have been procured in the bazar.

Wallago Russelli, Bleeker: *Silurus boalis,* B. H.; *S. wallagoo,* Val., &c. Extremely common: attaining to an immense size.

W. pabda; *Silurus pabda,* B. H.: *S. microcephalus,* Val. *Pábda* of Bengális, and certainly the true *pabda* of Buchanan Hamilton. Common: attaining to 9 or 10 in. long, at most.*

Schilbe garua; *Silurus garua,* B. H. Common: attaining to 14 in, in length.

Ailia coila; *Malapterurus coila,* B. H.: *Malapterus (Ailia) bengalensis,* Gray; *Ailia bengalensis,* Val., &c. Common.

Bagrus aor; *Pimelodus aor,* B. H. Tolerably common.

B. aorellus, nobis. *n. s.* Hitherto confounded with the preceding, but a

* W. anastomus, (Val.), is also enumerated from Calcutta by Dr. Bleeker.

much thicker fish in proportion to its length; the dorsal spine smaller, and uniformly granulose anteriorly,—instead of shewing a narrow white ridge, set off laterally with black, as in the AOR; the adipose dorsal fin less elongated, but higher, with the same black spot posteriorly; occipital bony process more developed, and posterior to this a small bony plate, not exceeding the occipital process in breadth (whereas the corresponding oval plate in B. AOR is fully twice as broad); at base of the first short dorsal spine, a bone formed of two lateral triangles well united in the middle,—whereas in B. AOR the union of the two lateral triangular bones is generally imperfect, and they are mostly quite distinct; occasionally, even in small specimens of B. AORELLUS, these bones are anchylosed to the oval bone in front of them,—but never in B. AOR. The palatal teeth in B. AOR are arranged in a subeven crescentic band; whereas in B. AORELLUS they are in two lateral sub-triangular masses united in the middle. Ten distinct soft rays to the pectorals and fourteen rays to the ventrals. Colouring much the same; but in B. AORELLUS there is a considerable admixture of black on the pectorals, ventrals, and membrane of the dorsal fin, which does not occur in the other. The two species are about equally common in the Calcutta bazar.*

B. CAVASIUS; *P. cavasius,* B. H. Common: rarely exceeding 7 in. long.†

B. TENGARA; *P. tengara,* B. H. Common.

B. GULIO; *P. gulio,* B. H.: *B. albilabris,* Val.‡ The *Nuna Tengara* of the Bengális, corrupted into *Nonatora* in the *Histoire des Poissons.* Extremely common: attaining to about 10 in. long.

* Another, closely akin, exists in the B. SINGHALA (*Platystoma singhala,* Sykes); and a fourth in the B. AORINUS of Jacquemont. The latter is not represented to have the conspicuous black spot on the adipose dorsal seen in the others; but neither is it represented in Jacquemont's figure of B. AOR! Buchanan Hamilton's figure of B. AOR represents a young specimen, but still the dorsal spine is not represented of sufficient magnitude. There is also a *B. aorides,* Jerdon, *Madr. Journ.* XV, 336, with maxillary cirri reaching to the tail. In B. AORELLUS they reach to the middle of second dorsal. B. AOR, B. AORELLUS, and OSTEOGENIOSUS CANTORI, are frequently attacked by an ÆGA, which buries its head in the adipose flesh anterior to the second dorsal and the caudal fins.

† The nearly affined *B. keletius,* Val., is enumerated from Calcutta by Dr. Bleeker.

‡ Dr. Bleeker adds, as synonymes, *B. abbreviatus* and *P. fuscus* of the *Histoire*

B. MENODA; *P. menoda*, B. H.: *B. carsio*, Cuv. *R. A.* (nec *P. carcio*, B. H.); *B. corsula*, Val.; by mistake marked *Mugil corsula* in pl. 1 of Buchanan Hamilton's 'Fishes of the Ganges'; but the original drawing (or a copy of it) marked *P. menoda* in B. Hamilton's hand-writing. Tolerably common: attaining to 14 in. long. A very mucous fish; and those brought to the bazar are commonly much clotted over with an adhesive clayey mud, as if they had burrowed into it; and they are mostly brought many together, appearing as if dug out from the mud of ponds or *jhils* more or less dried up.

B. URUA; *P. urua*, B. H.: *B. exodon*, Val. Identified from a drawing by Buchanan Hamilton. Common; but not often brought to the bazar.

ARIUS GAGORA apud Bleeker; *P. gagora*, B. H. (in part). Excessively common; but I have not been able to obtain it over 17 in. long, whereas B. Hamilton's *gagora* is described to attain to about 3 ft.: he having evidently confounded this and the next species. The present is indeed the commonest of the whole tribe in the Calcutta fish-bazars, and *Bagrus gulio* is the next in abundance: both of these may daily be obtained of all sizes; but I have rarely met with any but adults of A. GAGORIDES and A. ARIOIDES, and only adults of BAGRUS MENODA, which when brought are generally in quantity. The spines of A. GAGORA are less strongly pectinated in front than in B. Hamilton's figure of the species; and there is the usual prolongation of the dorsal beyond its spine. Dorsal and pectoral spines moderate, comparatively slender, and granulated in front only, the sides being striated. The upper labial cirri reach back to base of pectoral spines. Mouth comparatively small, its cleft scarcely reaching back one-third to below the eye. *Palatal teeth mammilliform, and totally unlike the maxillary teeth;* whereas in the next two species, the palatal and maxillary teeth are similar. No blackish tinge on the ventral and anal fins; nor trace of aureous wash on the upper-parts. A specimen 10 in. long has the dorsal spine 1½ in.; and one of 15 in. has the dorsal spine 2 in.

A. GAGORIDES; *Bagrus gagorides* and *B. trachypomus*, Val.: *P. gagora*, B. H. (in part). Nearly affined to A. ARIOIDES; but the interparietal plate differs in shape, and the upper cirri reach only to base of pectorals, as in A. GAGORA. Upper lip, as seen from beneath, protruding in the middle, so as to be there twice as broad as at the sides. Dorsal and pectoral spines much stouter than in A. GAGORA, and granulated half-way on the sides towards the front. General hue dull lurid purple with a

des Poissons,—and *B. gulioides*, *B. melas*, *B. Schlegelii*, and *B. rhodopterygius*, Bleeker.

golden shine; the head browner: fins purple; no dark spot on the adipose dorsal; and the lower-parts subdued white, studded over with minute dusky specks (which also occur in A. ARIOIDES, but to a less extent). This species is rarely procurable of small size, and it commonly occurs $2\frac{1}{2}$ ft. or more. In a specimen $5\frac{1}{4}$ in. long, the dorsal spine measures $1\frac{3}{16}$ in.; in one of 10 in., $1\frac{7}{8}$ in.; of 15 in., $2\frac{1}{2}$ in.; of 2 ft., 4 in.; of $2\frac{1}{2}$ ft., $4\frac{3}{4}$ in.; and of $2\frac{3}{4}$ ft., 5 in.: the membrane of the dorsal is scarcely prolonged beyond its spine, to a much less extent than in the two other species. Occasionally, though rarely, one or more of the cirri are divided in this fish, as usual in several of the Nilotic SILURIDÆ. It is not uncommon.

A. ARIOIDES; *Bagrus arioides,* Val.; *Pimelodus auratus,* B. H. (*MS.* on coloured drawing, nec B. AURATUS, Val.). Tolerably common, or rather now and then brought in quantity: attaining to about 12 or 13 in. long. Upper cirri reaching back to base of dorsal spine. The dorsal and pectoral spines proportionally larger than in A. GAGORIDES, also more strongly pectinated behind, and more extensively granulated on the sides; the membrane of first dorsal prolonged beyond the spine, as usual as in the present group. All the fins are suffused with black, more or less. A distinct aureous wash on the upper parts, which begins to make its appearance when the fish is about 6 in. long; prior to which the general hue is plain plumbeous or livid, with the fins conspicuously almost wholly purple-black. Eyes proportionally large. Mouth (as in A. GAGORIDES) broader than in A. GAGORA; its cleft reaching half-way to below the eye, as seen in profile. A specimen 12 in. long has the dorsal spine $2\frac{3}{8}$ in., and one exceeding 13 in. has it $2\frac{3}{4}$ in.

RITA BUCHANANI, Bleeker: *Pimelodus rita,* B. H.; *Arius rita* et *A. ritoides,* Val. Common, chiefly in the hot season.

OSTEOGENEIOSUS CANTORI, Bleeker: *Àrius militaris* of Gangetic rivers, *auctorum.* Somewhat rarely brought.

PANGASIUS BUCHANANI, Val.: *Pimelodus pangasius,* B. H. Very common.

SILUNDIA GANGETICA, Val.: *Pimelodus silundia,* B. H. Very common.

BAGARIUS BUCHANANI, Bleeker: *Pimelodus bagarius,* B. H. Not rare. Attains an enormous size, but large specimens are seldom brought to the bazar.

PIMELODUS GAGATA, B. H. Not rare during the rains.

CLARIAS MAGAR; *Macropteronotus magur,* B. H. Very common.

SACCOBRANCHUS FOSSILIS; *Silurus fossilis,* Bloch: *S. singio,* B. H. Extremely common.

PLOTOSIUS CANIUS, B. H. Very common.

Of Esocidæ, Buchanan Hamilton notices only three species, all of which are assigned by him to the old genus Esox. These are—Belone cancila, (B. H.), Hemirhamphus ectuntio, (B. H.—angulatus, *ibid.*, on unpublished drawing), and Panchax Buchanani, Val. Two species of Belone and three of Hemirhamphus, however, are about equally common in the Calcutta provision-bazars ; and another species of each genus occurs at the Sandheads, at the mouth of the Hughli. A second Panchax also is sometimes brought in great numbers to the fish-bazars.

Belone tenuirostris, nobis, *n. s.* As compared with B. caudimacula, Cuv., the general form is more slender, elongated, and compressed; with jaws of equal length (minus the cartilaginous tip of the lower), narrow and considerably more tapering in width to the extremity. Head a third of the entire length. Eyes moderately large, occupying about three-fifths of the vertical diameter of the head. Series of longer teeth slender and uniform in both jaws, becoming gradually smaller towards their tips; the minute intermediate teeth being so small as to be barely perceptible. Cheeks distinctly scaled. Low hind portion of the dorsal and anal fins much developed : the other fins of the usual proportions.

D. 19.—A. 24.—P. 11.—V. 6.—C. 15 (exclusive of the short exterior rays).

Colour greenish above, silvery below, with a very brilliant silvery stripe along each side, broadening posteriorly ; the lower portion of the operculum also brilliant silvery, and likewise the sides of the lower jaw. Fins yellow more or less, with some black at the tips of the pectorals, and middle of the fork of the caudal—no spot at base of caudal, as in B. caudimacula.—From the Sandheads.

Our other species are—

B. caudimacula, Cuv.; Russell, pl. 176. Found also in the China seas.

B. cancila; *Esox cancila,* B. Hamilton.

The B. annulata, C. V., keeps further out to sea, but is common on the coast of Orissa.

Of Hemirhamphus, the next three species are brought commonly to the Calcutta bazars.

H. ectuntio ; *Esox ectuntio,* B. H. With upper jaw about a third as long as the lower, flat, and tapering from about the middle to an obtuse point. Eyes but half the vertical diameter of the head. Tail rounded, Ventral fins small, placed near the anal, and reaching close to the anus. In a specimen $6\frac{3}{4}$ in. long, the lower jaw exceeds the upper by 1 in., and the upper from cleft of mouth measures $\frac{1}{2}$ in. According to Buchanan Hamilton, this fish "does not exceed a foot in length." I have not obtained it so large as 7 in. He states, also, that "each side has a broad

longitudinal stripe, shining like silver." The sides are indeed silvery, but ill-defined, except where forming a narrow streak towards the tail.

D. 13.—A. 11.—P. 7.—V. 5.—C. 14.

This species seems to be affined to H. Reynaldi of Valenciennes.

H. brachynotopterus, Bleeker : *Esox angulatus*, B. H. (*MS.* on drawing). Upper jaw very short, triangular, broader than long, almost flat but with distinct angulate ridge. Eyes three-fifths of the vertical diameter of the head. Tail furcate. Ventrals placed midway on the body, far anterior to the anus. In a specimen 7 in. long, the lower jaw exceeds the upper by $1\frac{1}{8}$ in., and the upper jaw from cleft of mouth measures $\frac{3}{16}$ in. I have not seen it larger. A narrowish well defined silvery stripe extends from the base of the pectorals to the middle of the caudal. The dorsal fin contains 11 to 13 rays in perfect specimens.

D. 11 to 13.—A. 15.—P. 7.—V. 6.—C. 14.

H. striga, nobis, *n. s.* With upper jaw subtriangular, rounded in front, a little longer than broad, flat, with very indistinct trace of angulate ridge; the lower jaw much longer than in the two preceding species. Eyes three-fifths of the vertical diameter of the head. Tail rounded. Ventrals small, placed near but not reaching to the anus. In a specimen $8\frac{1}{2}$ in. long, the lower jaw exceeds the upper by $2\frac{1}{8}$ in., and the upper jaw from cleft of mouth measures $\frac{1}{4}$ in. Lateral silvery stripe narrow and little perceptible, excepting towards the tail, where broader and distinct. A medial dusky line along both mandibles and middle of the fore-part of the back. Operculum brilliant silvery.

D. 12 or 13.—A. 8 or 9.—P. 9 or 10.—V. 6.—C. 14.

H. plumatus, nobis, *n. s.* General aspect of preceding species, but the eye less than half of the diameter of the head: the lateral scales of the body also much larger; and the upper jaw tapering to an obtuse point, and distinctly angulated. Each nostril covered by a remarkable plume of filaments. Tail furcate. Ventrals placed near the anus, but not reaching to it. In a specimen 11 in. long, the lower jaw exceeds the upper by $2\frac{1}{2}$ in., and the upper from cleft of mouth measures $\frac{1}{2}$ in. A well defined silvery stripe from base of pectorals, becoming rather broad towards the tail.

D. 15.—A. 13.—P. 9.—V. 6.—C. 15.

From the Sandheads, and also the coast of Ceylon.

Our species of Panchax are—

P. Buchanani, Valenciennes; *Esox panchax*, B. H. To the numerous synonymes of this species collated by Dr. Bleeker, add *Aplocheilus rubrostigma*, Jerdon, *Madr. Journ.* XV., 331.

P. cyanopthalma, nobis, *n. s.* Smaller than P. Buchanani, not

exceeding $1\frac{1}{4}$ in. long, with fins less elevated and tail much less pointed; the eyes also less distantly apart, and of a brilliant pale nacreous azure (those of the other being yellow). Colour whitish, diaphanous, studded with dark specks which are less numerous below the lateral line: scales large, barely discernible.

D. 7.—*A.* 22 or 23.—*V.* 3.—*P.* 5 ?—*C.* 14.

This minute fish is sometimes brought to the bazar in considerable quantities, many pounds' weight of them together. Occasionally, a few of the P. Buchanani may be picked out of the mass, and some fry of other fishes, especially Mugil corsula; but the present species, remarkable for its conspicuous light blue irides, predominates in the rate of 50 or more to 1 of any other. Wherever it occurs, therefore, it would seem to abound excessively.

The following Cyprinidæ may likewise be here described.

Systomus microlepis, nobis, *n. s.* Much resembling S. Ogilbii (*Rohtee Ogilbii,* Sykes);* but with still smaller scales, and the dorsal spine is more finely pectinated behind. Scales larger on the anterior two-fifths of the body; and a series of 44 of them, counting obliquely downward, and of 73 along the lateral line.

D. 3-7.—A. 1-18.—P. 13.—V. 7.—C. 19.

Spinous ray of anal fin minute: the pectorals not reaching to base of ventrals: tail furcate. Colour (*blanched* in spirit) silvery throughout. Length of specimen, to end of tail-lobes, $6\frac{1}{2}$ in.; and depth at base of dorsal fin. $2\frac{3}{8}$ in. Form very Bream-like.

Hab. ———— ?

Leuciscus salmoides, nobis, *n. s.* Affined to *L. goha* (*Cyprinus—Barilius goha,* B. H., v. *Opsarius gracilis,* McClelland); but larger and deeper in the body, with the spots smaller, much more numerous, and more regularly disposed, many of them occurring below the lateral line, and others on the opercula and præ-opercula: upper lip studded with pores.

D. 10.—A. 13.—P. 14.—V. 9.—C. 18.

Lateral line composed of 88 to 90 scales; and oblique series of 26 scales descending from anterior base of dorsal. Length of specimen 11 in. Colour blanched in spirit. Procured at Allâhabâd by the late Major Wroughton.

L. lineolatus, nobis, *n. s.* A Perilampus of McClelland, affined in

* Dr. Jerdon refers the species of *Rohtee,* Sykes, to Abramis; but they clearly appertain to Systomus, as assigned by Dr. Bleeker: *vide* dorsal spines, &c.

form to L. DANICONIUS *(Cyprinus daniconius,* B. H.), but the lateral line placed very low, as in DANGILA; and readily distinguished by its peculiar markings. A dusky spot behind the gill-covers, placed in a whitish space; beyond which a broad darkish band extends to the middle of the tail, bordered by a narrow pale line above and below, the lower not reaching so far forward as the upper: below this again another dark band, and then white; and above a second and trace of a third pale line.

D. 12.—A. 14.—P. 11.—V. 8.—C. 18?

Series of 10 oblique scales, the lateral line on the 9th of them, and numbering about 32 scales. Length of specimen $3\frac{1}{4}$ in. Procured at Darjiling by Major Sherwill.

L. BINOTATUS, nobis, *n. s.* Affined to L. CASUATIS, (B. H., v. *Systomus malacopterus,* McCl.), but less deep in the body, and the dorsal fin much smaller; with a conspicuous black spot on the middle of base of tail, and another at hind base of dorsal: the rest green, with silvery lateral streak and below, and traces of a dark band along the lateral line; which last is medial and is composed of about 25 scales: oblique series of scales 7; the line passing along the fourth of them from above. Eyes rather large, and silvery.

D. 9.—A. 6.—

Length of specimen $1\frac{1}{2}$ in. From Ceylon. Dr. E. F. Kelaart.*

* The SYSTOMUS TRIPUNCTATUS, Jerdon, is perhaps a LEUCISCUS akin to the above.

From Messrs. T. H. Hamilton & Co. The nest of a common Crow (CORVUS SPLENDENS), constructed in great part of the wires used in fastening down the corks of soda-water bottles. Two Crows' nests thus composed are noticed in the 'Calcutta Review,' Vol. XXVIII. p. 137; where it is observed that—"As it may well be wondered where such an accumulation of these could be procured, we may remark that Bengali servants are in the habit of treasuring them up till they amount to a saleable quantity; and that enormous heaps of them may accordingly be seen in the shops of those not very respectable small dealers, whose proper avocation is, with similar shops in England, indirectly purported by the announcement.—' Dealer in Marine Stores.' The supply of materials, therefore is comprehensible, however curious its application.—E. B.

NOTE ON THE HOGS OF THE NICOBAR ISLANDS (*vide* p. 268.)

In some "Sketches at the Nicobars," published in the *Journal of the Indian Archipelago,* Vol. III, we read (p. 265) of preparations made for a feast. "*Enormous* Pigs strung by their legs to long poles, were carried, some by four others by six athletic men. These Pigs were truly most gigantic animals." This was in the island of Car Nicobar; and the Pigs in question were doubtless originally derived from the shipping. We have met with another notice referring to the large size of the Pigs in the Nicobar Islands.—E. B.

For July, 1858.

The Monthly General Meeting for July was held on the 6th instant.

Sir James Colvile, Knt., President, in the Chair.

The proceedings of the May meeting were read and confirmed. No meeting was held in June on account of the repairs.

Presentations were received—

1. From the Royal Prussian Academy of Sciences at Berlin, the latest publications of the Academy.

2. From the Ceylon Branch of the Royal Asiatic Society, the latest journals of the Society.

Mr. B. H. Hodgson and Dr. Falconer, duly proposed in March last were ballotted for and elected Honorary Members of the Society.

Mr. Sutherland duly proposed and seconded in May last, was balloted for and declared elected.

Communications were received—

1. From Baboo Radanauth Sikdar, an abstract of the Meteorological Observations taken at the Surveyor General's Office during the month of February last.

2. From the Venerable Archdeacon Pratt, M. A., a paper on the great Indian Arc of Meridian and the Figure of the Earth.

Mr. W. T. Blanford gave an account of the observations which had been made in Orissa by a party of the Geological Survey during the past season's field work, and exhibited to the Society the map of that province coloured geologically. The results of the examination were, that Orissa is mainly formed by the combined Delta of the rivers Mahanuddee and Brahmini, the deposits formed by which at their mouth have caused the land to gain upon the sea, and thus produced a considerable projection from the general run of the coast. A similar effect is seen at the mouth of the Godavery. While the Eastern portion of the province is formed of an extensive level plain, the western part is dotted over with detached hills, and near Balasore bounded by the fine range known as the Nilgiri hills. All of these peaks and ranges are composed of gneiss, except in the case of

a cluster of low ranges South and West of the town of Cuttack. These are composed of sandstone which has been referred to the same age as the rocks of the Mahadewa hills in Central India, but the connexion is not clearly established.

Laterite occurs largely in Orissa forming terraces like plains around all the hills up to a certain level, which level diminishes in height towards the East until at length the laterite is covered up by the alluvium of the low country. From various considerations it appears probable that there are, in Orissa, two kinds of laterite, one formed by detrital action and containing sand, rounded pebbles and boulders, the other resulting from the alteration in situ of gneiss or sandstone. The former appears to be invariably present where any laterite occurs. The quantity of iron contained appears difficult to account for.

Besides the flat Delta alluvium of Southern and Central Orissa, a considerable area in Northern Orissa is covered by an alluvium of older date which generally contains a gravelly form of laterite. Wherever the coast faces to the South-East sand hills occur, generally in several successive ranges one behind the other, each marking an old coast line.

In conclusion the uses to which many of the rocks of Orissa are put for building and other purposes were pointed out and the availability of some of them remarked on.

In a discussion which ensued Captain Sherwill explained the mode of occurrence of laterite in the Rajmahal Hills.

Captain Young gave some details relating to the same rock near Rangoon.

Professor Oldham described some curious phenomena connected with the occurrence of laterite in Ceylon and elsewhere, at the same time shewing that the name laterite had been applied without good reason to a number of different rocks distinct from that for which it was originally proposed.

Professor Oldham also mentioned that he had just been informed by a member, that a belief existed to the effect that formerly the bay between the mouths of the Brahmini and Soobunreeka was cultivated land, the sea being kept out by a bund which has since been destroyed. This rumour seems opposed by the present Geological

configuration of the coast, but it would be interesting to ascertain what foundation it has.

The Librarian submitted his usual monthly reports for May and June, 1858.

Library.

The following additions were made to the library during May and June, 1858.

Presented.

Abhandlungen der kon. Akademie der Wissenschaften, zu Berlin, for 1856, Royal 4to.—By the Prussian Royal Academy of Sciences.

Archæologia: or, Miscellaneous Tracts relating to Antiquity, *London,* Vols. 36 and 37, 4to.—By the Society of Antiquaries: London.

Biblioteca Arabo-Sicula ossia Raccolta di Testi Arabici che Toccano La Geografia, la Storia, le Biografie, e la Bibliografia della Sicilia, Fasc. I. to III. *Lipsia,* 1855 and 1856.—By the German Oriental Society of Liepzig.

Calcutta Christian Observer for May and June, 1858.—By the Editor.

Correspondence relating to the establishment of an Oriental College in London, *pamphlet,* 1858.—By the Writer.

Half yearly Paper of the Chamber of Commerce.—By the Chamber.

Journal Asiatique, Nos. 41 and 42.—By the Asiatic Society of Paris.

——— of the Agricultural and Horticultural Society of India, Vol. X. Part. I., *Calcutta,* 1858, 8vo.—By the Society.

——— of the Ceylon Branch of the Royal Asiatic Society, Vol. II. Nos. 1 to 3, and Part I. of 1856-58.—By the Society.

——— (Madras) of Literature and Science, Vol. III. No. 5, for October and December, 1857.—By the Madras Asiatic Society.

Memoire della Reale Accademia della Scienze di Torino, Serie seconde, Tome XVI. *Torino,* 1857, 4to.—By the Academy.

Monatsbericht der kon. Preuss. Akademie der Wissenschaften zu Berlin, from January to December, 1857.—By the Academy.

Macgowan's (Dr.) Remarks on Chinese Foreign Relations, *pamphlet,* 1857.—By the Author.

Meteorological Observations made at Dodabetta, 1851-55, 4to. Madras. —Through the Govt. of India (Home Dept.)

Oriental Baptist for May and June, 1858.—By the Editor.

——— Christian Spectator from March to May, 1858.—By the Editors.

Proceedings of the Royal Society, Vol. VIII. No. 27 and Vol. IX. Nos. 28, 29 and 30.—By the Society.

———— of the Royal Society of Edinburgh, Vol. III. No. 47.—By the Society.

———— of the Society of Antiquaries of London, Vols. III. and IV. Nos. 43 to 46.—By the Society.

Title-page of Vol. III. and List of Members of the Society.—By the Same.

Quarterly Journal of the Geological Society of London, Nos. 53 and 54.—By the Society.

Recueil des Actes De l'Académie Imperiale des Sciences, Belles lettres, et Arts de Bourdeaux, 1 et 2 Trimestres, 19th Annee, 1857.—By the Academy.

Report of the Calcutta Mechanics' Institution and a few other pamphlets. —By Babu Rajendralal Mittra.

Transactions of the Philological Society, London, for 1854, 1855 and 1856, 8vo.—By the Society.

———— of the Royal Society of Edinburgh, Vol. XXI. Part IV. 4to.—By the Society.

Tattwabodhini Patrica, Nos. 177 and 178.—By the Editor.

Weber's (Dr. A.) Indische Studien, Band IV. Heft. I. and II.—By the Author.

Weber's White Yajurveda, Part III. No. 12.—By the Author.

Werken van het Koninklijk Instituut voor Taal,—Land—en Volkenkunde van Nederlandsch,—Indie, Riezen en onderzoekingen in den Indischen Archipel door, D. S. Müller, Deel I. and II. 8vo.—By the Royal Institution of Netherlands.

Ditto, ditto Het Boek Adji-Sáká, *Amsterdam*.—By the Same.

Vividhartha Sangraha, Nos. 47 and 48.—By Babu Rajendralal Mittra.

Zietschrift der deutschen morgenlandischen Gesellschaft, Band XII. Heft 1, *Liepzig*.—By the German Oriental Society.

Exchanged.

Athenæum for February, March and April, 1858.

Annalen der Chemie und Pharmacia from December to March, 1858.

Calcutta Review (The) No. 59, March, 1858.

The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science, Nos. 99 to 101, March to May, 1858.

Purchased.

Annals and Magazine of Natural History, Nos. 3 to 5, 1858.

American Journal of Science and Arts, No. 74.

Annales des Sciences Naturelles, Nos. 5 and 6, Tome VII.

Comptes Rendus, Nos. 6 to 18, February 8th to 3rd May, 1858.

Edinburgh Review, No. 218 for April, 1858.

Journal des Savants for February and March, 1858.

Literary Gazette, Nos. 2140 to 2156, and extra Nos. 17 to 19 of 1856.

Natural History Review, No. 2. Vol. V. April, 1858.

Quarterly Review, No. 206, April, 1858, Vols. 92, 93, 94, 95 and 96.

Revue des Deux Mondes, 15th March to 1st May, 1858.

——— de Zoologie, Nos. 1 to 3, 1858.

Books.

Andersson's (C. John Mr.) Lake Ngami; or Explorations and Discoveries during four years' Wanderings in the Wilds in South Western Africa. *London*, 1856, 8vo.

Atkinson, T. Witlam, Oriental and Western Siberia, and Chinese Tartary.

Buffon's Histoire des Insects Lèpidoptères, Tome X. 8vo.

Barth's (Henry) Travels and Discoveries in North and Central Africa: being a Journal of an Expedition undertaken under the auspices of H. B. S. Government in the years 1849 and 1855 in 5 Vols. Recd. Vols. 3, 8vo. *London.*

Barges' Epistola.

Benfey's Indica.

Bopp's (Franz) Uber den Einfluss der Pronomina auf die Wortbildung im Sanscrit und den mit ihm, verwandten Sprachen, *Berlin*, 1832, pamphlet.

Burnouf et Lassen's Observations Grammaticales sur quelques Passages de L'Essai sur le Pali, *Paris*, 1827, *pamphlet.*

Bellot's Sanscrit Derivations.

Boehtlingk's (Otto) Die Unâdi Affixe, *pamphlet*, 4to.

Bochinger's (J. J.) La Vie Contemplative, Ascetique et Monastique chez les Indous et chez les Peuples Bouddhistes. *Strasbourg*, 1831, 8vo.

Brougham's (Lord Henry) Political Philosophy, Vol. I. 8vo.

Crawfurd's (John) Dictionary of the Indian Islands and adjacent countries, *London*, 1856, 8vo.

Candolle's (M. Alph. de) Géographie Botanique Raisonnée, Tomes I. and II. *Paris*, 8vo. 1855.

Deslongchamps' (A. L.) Amarkocha ou vocabulaire D'Amarasinha publié en Sanskrit avec une Traduction Francaise, Parts I. and II. *Paris*, 8vo. 1845.

Fournel's (Henri). Etude sur La Conquéte de l'Afrique par les Arabes Part I. *Paris,* 1857, 4to.

Hardwicke's (C.) Christ and other Masters : an Historical enquiry into some of the chief parallelolisms and contrasts between Christianity and the religious systems of the Ancient World. Part II. Religions of India, *Cambridge,* 1857, 8vo.

Julien's (St.) Histoire de La vie de Hiouen-thsang et de ses voyages dans L'Inde, *Paris,* 1853, 8vo.

Koeppen (C. F.) Die Religion des Buddha und ihre Entstehung, *Berlin,* 1857, 8vo.

Leguest's (M. L'Abbe) Etudes sur la formation des Races Sémitiques suives de considerations générales sur l'origine et la developpement du Language, *pamphlet, Paris,* 1858.

Malkuma's Poems.

Néne (F.) Essai sur le Mythe des Ribhavas premier vestige de L'Apotheose dans le Véda. *Paris,* 8vo. 1857.

Notices et Extracts des Manuscrits de la Bibliothèque du Roi et autres Bibliothèques, Tome X. to XIV. (Vol. 14 has 2 parts) and Tome XVII. Parte 2nd, 4to.

Pavie (Théodore) Tarikh i Asham Récit de l'expedition de Mir Djumlah au pays D'Assam, *Paris,* 8vo. 1845.

Rubuer Il Die Riese Seiner Koniglichen Hoheit des Prinzen Waldemar von Preussen noch Indien in den Dohren, 1844 bis 1846, *Berlin,* 1857.

Spier's (Mrs.) Life in Ancient India, *London,* 8vo.

Spiegel's (Dr. F.) Anecdota Pâlica, *pamphlet, Liepzig,* 1845.

Thuillier's (H. L.) and Capt. R. Smyth's Manual of Surveying for India, 8vo. 1855.

Vuller's (Joannis Augusti) Lexicon Persico-Latinum, Fas. V. Parts I. and II. 4to. *Bonera,* 1856-57.

Weber's Indische Studien, Band IV. P. 2.

Westminster Review, No. 26, April, 1858.

Wilson's Leighton (Rev. J.) Western Africa; its History, Condition and Prospects, *London,* 8vo. 1856.

Woodward (S. P.) A Treatise of Recent and Fossil Shells, 3 Nos.

——— Ditto (new copy) 12mo.

Gourdass Bysa'ck,
Librarian and Asstt. Secy.

The Asiatic Society's Rooms,
8th July, 1858.

For August, 1858.

The Monthly General Meeting for August was held on the 4th instant.

Hon'ble Sir James Colvile, Kt., *President*, in the chair.

The proceedings of the July Meeting were read and confirmed.

Presentations were received—

1. From Capt. Bivar at Debrooghur through Dr. Mouat, some fragments of Hindu sculpture consisting of an image of the Hindu Deity Durga or Dossovooja and a portion of a cornice frieze. Capt. Bivar has promised a communication on the subject, but it has not yet been received.

2. From the Acting Principal of the Government Grant Medical College Bombay, a copy of the Report for the session 1857-58.

3. From the Raja Pertap Chundra Singh Bahadur, a copy of the Ratnavali Natika in Bengali, with an English translation by M. M. S. Dutt, Esq.

A note from Lieut.-Col. Jenkins expressing his wish to withdraw from the Society was recorded.

The Council submitted a report announcing that they had appointed Dr. Crozier, a member of their body, in place of Dr. Boycott, who had left India; and also that they had added Babu Ramgopaul Ghose, to the Finance Committee, and Dr. Crozier to the Committee of Natural History.

Communications received—

1. The following note, accompanied by a copper plate, from Mr. Biss, Assistant, Revenue Accountant's Office:—

Dear Sir,—The accompanying copper plate was unearthed some 20 years ago in Lot No. 55 of the Soonderbunds in digging a tank. In the vicinity of the spot where it was found there are ruins of the abode apparently of some wealthy person.

Whether or not the inscription on the plate is of any interest I cannot say, but as I have reason to suppose it to be of ancient date, I would leave it with you to submit it for the inspection of the Society, or not, as you may deem fit. I can at present only offer it for inspection it being the property of another.

Yours faithfully,

(Sd.) T. W. Biss.

Babu Rajendralal Mittra supplied the following information regarding the plate:—

The plate is an oblong of $11\frac{1}{2}$ inches by 6 inches with an arched projection at one end with two perforations. It has a Sanskrit inscription of 15 lines on one side and 14 on the other; the characters being the Gour of the same date as the Backergunge plate noticed in the 8th volume of the Asiatic Society's Journal. The plate has been very much injured by exposure to the atmosphere and the inscription is almost illegible. From a few lines in the centre of the obverse it appears that the plate was inscribed (as generally such plates are) to record the grant of a piece of land in the Soonderbuns, bounded on the east by the bank of the Matanga River, on the south by the sea and on the west by *Kukuta pattana.* The date is illegible, but from the occurrence of the name Vaidyaka Sena, and the style of the writing, the gift is supposed to be of the period of the Sena Rajas of Bengal.

2. From Babu Radhanauth Sickdar, being an Abstract of the Meteorological Register kept at the office of the Surveyor General, Calcutta, for March and September last.

Lieut.-Col. Strachey explained to the meeting the application of certain sliding scales to arithmetical computation.

The Librarian submitted his usual monthly report for July last.

Library.

The following additions were made to the Library during July 1858.

Presentations.

Annals of Indian Administration. The Indian Official Thesaurus, being Introduction. Compiled by M. Townsend.—By the Home Government.

Ditto, Parts III. to VI.—By the same.

Calcutta Christian Observer for July, 1858.—By the Editors.

Oriental Baptist, No. 140, for July, 1858.—By the Editor.

Oriental Christian Spectator for June, 1858.—By the same.

Report on the Revenue Administration of the Lower Provinces for 1856-57.—By the Bengal Govenrment.

Ditto on Public Instruction in the Madras Presidency for 1856-57.—By the Home Government.

Selections from the Records of the Bombay Government with four Maps, No. XLV. Report on the upper portion of the Eastern Naraca, and the feasibility of restoring it as a permanent stream, accompanied by Maps and Plans.—BY THE BOMBAY GOVERNMENT.

Report of the Konnugor Seminary, Sessions 1857-58.—BY BABU SEEBCHUNDER DEB.

Calcutta Review, No. 60, for June, 1858.—BY THE EDITOR.

Erratum, p. 17, first line, For "*C.* 1—16," read *C.* 16.

JOURNAL

OF THE

ASIATIC SOCIETY.

No. IV. 1858.

A few remarks on the first fasciculus of Professor Wilson's *Sanskrit Dictionary, as "extended and improved"* by Dr. Goldstucker,—by Fitz-Edward Hall, M. A.

The first eighty pages of the work in question—all of it that we have yet seen—correspond to a little more than twenty-nine pages of Professor Wilson's dictionary in its second impression. No small portion, indeed, of this increase of matter is only apparent, and due to a more sumptuous style of typography; and yet Dr. Goldstücker's own additions are by no means inconsiderable. The literature of the Veda, and of Sanskrit law, medicine, philosophy, and rhetoric will doubtless be rendered much easier of acquisition than formerly, if the editor carries his design to the end on the same plan with that of its commencement. The subject of etymology has, also, at last received the attention of a scholar familiar with the terminology of the native grammarians; and, if only as a necessary consequence, the arrangement of the significations of homonymes is now noticeably less bewildering than it was of old. In general, there is scarcely a page of the new revision that does not testify to extensive research and to great and conscientious labour.

On the other hand, Dr. Goldstücker's scheme appears to us to be, in some respects, susceptible of amendment. Why, for instance, the constantly recurring compounds, which even the merest tyro can resolve for himself, when he meets them? The vocabulary of the Sanskrit has, for artificial copiousness, a very imperfect analogue,

in that of the Greek. In the first place, as to the verbal elements of the latter language, the line has been clearly defined which demarcates what is classical, or legitimately developed, from what is inadmissible; chronology being, for the most part, the criterion. Experience, moreover, has shown it to be practicable to embrace, within a reasonable compass, all the complex terms that occur in extant Greek authors: and the accession of such terms, from works likely still to be discovered, is contemplated without apprehension. But the case is found to be very different indeed, when we turn to the Sanskrit. For who, here, is not classical, or, at least, is not of weight for his words? The next century may solve the problem; but our own—for which Dr. Goldstücker is working—will not. We propose this consideration with a definite object. Let it be presumed that, by and bye, accidental critics will concur in distinguishing certain compositions, say to the number of two hundred, as possessed of the characteristic of classicality. Yet, even in these circumstances, we should scarcely expect a lexicographer, after well weighing his functions, to go about to accumulate all the words occurring in them, of the sort to which we refer. Still more unfeasible, and equally supererogatory, would it be, if the entire body of Sanskrit literature were ever thought deserving of lexical treatment, to attempt a complete collection, from it, of vocables of this description. No twenty folios might avail to exhaust them. The assertion is not to be questioned, that the ancient Hindus invented compounds at will; and such, to this day, is the practice of the pandits. No such terms, to our thinking, should ever have place in a dictionary, unless they are technicalities, or unless their acceptation is not at once to be gathered from their factors; the knowledge of one or two facts of Hinduism, and a moderate acquaintance with the grammar, always being postulated in the inspector.*

* Dr. Trench has spoken boldly, but wisely, on the subject of bettering our English Dictionaries; and one most important respect in which they are capable of melioration is, as he urges, in the way of retrenchment. On the point of the claim of compounds to be inserted in our dictionaries, he holds the following language: "When words have been brought into close connexion with one another, not in the choice or caprice of one writer, and on a single occasion or

We will illustrate our meaning by a single example, and one which we have not gone far to seek. In common Sanskrit there are some thirty current words for 'earth,' ten for 'man,' four for 'master' or 'lord,' and six verbal suffixes for 'holder,' 'protector,' or 'enjoyer.'* Now, in our own limited reading we have, with only a few exceptions, met with a majority of the words for 'master' and suffixes for 'holder' or 'enjoyer' annexed to each of the words for 'earth;' and so of the synonymes for 'man,' followed by the synonymes for 'lord:' the result being always the same, the equivalent of 'king.' And, if any one of those three hundred and forty allowable regal composites may claim to be represented in a lexicon, why may not all? On the principle with which Dr. Goldstücker has set out, we are to have all, in process of time; on the condition, possibly, that, in the course of his studies, he obtains proof of their having actually been used. The same remark applies to the words for 'sun,' 'moon,' 'Bráhman,' &c. &c. Three lines of explanation in the preface would economize many times three pages of quite gratuitous symbols. Our fear of seeing the new edition of Professor Wilson's dictionary overloaded with superfluities has only too good ground, if we may augur from the sample before us. Out of the twenty articles which make up the first page—and it is not a full page—there are six which, in our judgment, have no right there: अशणिन्, अंशकरण, अंशभाज्, अंशहर, अंशहारिन्, अंशुजाल; and so onward everywhere. The particular specimens just given were, we are aware, in Dr. Goldstücker's original: but, even though he may not have been permitted to strike them out, yet we suppose he was under no compulsion to add, indefinitely, new ones of the same stamp. Hundreds of words beginning with the negative

two or three occasions, but by the consenting use of many, appear in constant alliance, being in this their recognised juxta-position to all intents and purposes a single word, they may then claim their admission of right." *On some Deficiencies in our English Dictionaries*, p. 50. Why not exclude, as a rule, all that we do not naturally write without a hyphen?

* We might have gone very much further. There are, in post-vaidika Sanskrit, upwards of sixty words for 'earth.' See Professor Williams's English and Sanskrit Dictionary.

prefix अ or अन्, and with the intensive particle अति, could, without the slightest loss, also be dispensed with. If अतिप्रौढयौवन have a title to presentment, why should any combination whatever of a particle, an adjective, and a substantive, into an epithet, be extruded, when it shews itself?

Nor have we yet done. The proper names of heroic and mythical personages mentioned up and down the *Mahábhárata*, the *Rámáyaṇa*, the Puráṇas, &c., can hardly be less than a hundred thousand. Yet none of them is to be neglected by Dr. Goldstücker, if he adheres to the method, on which he has begun, of pouring a biographical index into a dictionary proper. Half a quarto page and more is assigned to Angiras, two-thirds of a page to Atri, one-third of a page to Agasti, and as much to Agni. Descending to the limits of sober history, the kings of Cashmere, their wives, their daughters, their chamberlains, and their generals, have, each, a niche. Even Adwaitánanda is remembered: "one of the founders of the Vaishṇava sect in Bengal. He lived about the end of the fifteenth century." Nor are the shadowy actors in avowed fictions reckoned unworthy of commemoration; such as Anangasená, "the proper name of a courtesan in a drama." That the cloak of indefiniteness is thus thrown about this frail beauty may, by possibility, not be a squandering of generous delicacy: but, at the same time, it is pertinent to enquire why she should here be obtruded on us, even for half-acquaintance. The *Vásavadattá* of Subandhu introduces us, in one place, to a whole novenary of nymphs, and, in another, to a drawing-room of as many as two and thirty; all of them, on charitable presumption, quite as it was expected they should be, in spite of the somewhat warm tone of their conversation. Though the alphabetical leader of them, Anangalekhá, has, we perceive, eluded Dr. Goldstücker's attentions, he should thank us for intimating to him that just two score still await the courtesy which he cannot now, with any more grace than consistency, deny them. Again, in the *Harsha-charita* we read of thirty-eight lads and lasses —their names all spelled out at length—who used to assist Báṇa when he played at royalty. And why, by parity of reason, should Charaṇákaranka. Kalákaláda, Haraṇika, and the rest be forgotten? The *S'ankara-dig-vijaya* likewise contains some hundreds of proper

names; and it is no sufficient reason to reject them, that they belonged mainly to misbelievers. To say nothing so special of the other divinities, the spots held sacred to S'iva alone are all but innumerable; and so are the phalli which bear separate designations. Once more, the eighty or ninety *Sahasra-námas* of themselves furnish as many thousand accredited epithets of gods and goddesses. Why should a single one of them be slighted?

Looking still more narrowly into Dr. Goldstücker's undertaking, it appears, in fact, to wear the pretensions of a veritable encyclopædia; bibliography and geography, no less than biography, constituting a component part of his comprehensive enterprise.* Upanishads, sections of the Veda, apocryphal hymns, the *Atri-sanhitá*, the *Adbhuta-rámáyaṉa*, and the *Anarghya-rághava* of Murári, all have articles. As the number of distinct Sanskrit works in existence is, probably, not less than ten thousand, a mere list of them, be it ever so meagre of details, would alone take up a volume.

It must be obvious, by this time, that the system on which the dictionary of Professor Wilson is undergoing reconstruction involves, in copious proportion, many specialties that are altogether misplaced. The new edition, which aiming at much more than is attempted in any rationally digested lexicon of Latin or Greek, yet falls short of their standard in, at all events, one most essential particular. We mean, in its citing no authorities.† On countless

* Our industrious Teuton appears, in truth, to have copied, however unconsciously, the method of our English dictionaries, as they were loosely styled, which preceded that of Johnson. These disorderly repertories, Dr. Trench describes as being "not dictionaries of words only, but of persons, places, things: they are gazetteers, mythologies, scientific encyclopædias, and a hundred things more; all, of course, most imperfectly, even according to the standard of knowledge of their own time, and with a selection utterly capricious of what they put in, and what they leave out." *On some Deficiencies*, &c., p. 45.

† The learned and judicious critic already twice cited speaks for all the world, equally as for himself,—the sciolists who cling to the shade of Dr. Webster excepted,—when he says: "To me there is no difference between a word absent from a dictionary, and a word there, but unsustained by an authority. Even if Webster's *Dictionary* were in other respects a better book, the almost total absence of illustrative quotations would deprive it of all value in my eyes." *On some Deficiencies*, &c., p. 7, foot-note.

occasions have we gone back from Professor Wilson's second edition, which likewise gives none, to the first, where they are often noted, and have thus obtained a clue by which to satisfy our misgivings. And what student of the Sanskrit does not do so constantly? Who, above all in the infancy of our knowledge of the Sanskrit, will not insist upon some better warrant for what he accepts, than a simple implied *dixit magister?* In the present instance, a want of space can scarcely be received as an apology for the defect here indicated; for space in all abundance might have been secured by sacrificing but a small fraction of what we have designated as intrusive. The present observations are written without an opportunity of inspecting the thesaurus of Messrs. Böhtlingk and Roth. It is to be hoped that the procedure adopted in it, as concerns the adducing of authorities, is more scholastic than that of Dr. Goldstücker. As for the English of the sheets before us, considering that they were printed in Germany, its correctness is highly commendable. Nor are such errors as meet the eye of a kind to occasion perplexity. The principal that we have noticed are "a pumpkin born out of season," a woman who "has born him children," "hypothenuse," "neutre," "filtre," "shrewed," "ennuque," and "different than." The system of romanization is not uniform throughout: for example, "*dwandwa*" and "*dvandva,*" "*ahankára*" and "*ahamkára,*" "*manvantara,*" and "*sarwakarman.*" "अजपाल" is a mistake* for अजापाल,'

It is high time, on other grounds, that the superficial but pretentious work here glanced at, should receive a thorough exposure at the hands of some such man as Dr. Trench. Before learning English himself, Dr. Webster undertook to teach it to others. Here is a sample. "*Feel* this piece of silk, or *feel of* it." We could easily bring forward a hundred other proofs of ignorance as gross as this. A Yankeeism, however, was, to Dr. Webster, even when he knew it for such, no solecism. Are Englishman who confide in his awards generally aware of this fact?

* एकदा वत्सरे प्राप्ते अजापालो नृपात्मजः ।
अयोध्याधिपतिः श्रीमान् शक्रतुल्यपराक्रमः ॥
अष्टोत्तरशतव्याधीनजाः कृत्वा ररक्ष च ।
सपादलक्षं जीवन्ति प्रजास्तस्मिन् महीपतौ ॥

Revá-mâhátmya, 25th chapter.

This seems to mean that Ajápála, king of Ayodhyá, being afflicted with one hundred and eight bodily ailments, relieved himself by turning them into she-

and "अध्यारोपन" for "अध्यारोपण." We should, farther, write 'Bṛihaspati' for "Vṛihaspati," 'अंशुबाण' for "अंशुवाण" 'अक्षीब' for "अक्षीव," 'अग्निबाण' for "अग्निवाण," 'अग्निबाहु' for "अग्निवाहु" and "अग्निबीज' for "अग्निवीज," The neuter "Brahma" occurs written "Brahman" also.

How far Dr. Goldstücker has consulted the native vocabularies is left pretty much to conjecture. Many compilations of this kind, unknown to Professor Wilson, could be procured, in this country, without difficulty; and probably not one of them, however insignificant or unoriginal, would be without value. Such as have fallen, as it were spontaneously, in the way of the writer of these lines, are here enumerated.

1.—The *Amara-kos'a-vivṛiti*, by Lingaya Vangala, commonly called Lingam Bhaṭṭa. The author is said to have lived in the south. A commentary on Amara.

2.—The *Budha-manohara*, by Mahádeva, surnamed the Vedántin. Another commentary on the *Amara-kos'a.* Imperfect, so far as seen.

3.—The *Náma-ratnákara*, by Koï Deva.

4.—The *Náma-sangraha-málá*, by Appayya Díkshita—not Árya Díkshita.

5.—The *S'abda-praká'sa*, digested at the instance of some Muhammadan of note, whom the author styles "Khána Nṛipati." It is a dictionary of homonymes. The only MS. which we know of is defective. It was copied in the *Samvat* year 1575.

6.—The *S'abda-prabheda*, by Mahes'wara. This is a work of small extent, on words variously written, and is in verse. It is not to be confounded with a section of like character in the *Vis'wa-prakás'a*, which likewise has a Mahes'wara for its author.

7.—The *Nánártha-kos'a*, by S'ás'wata.

8.—The *Nánártha-ratna-tilaka*, perhaps by Mahípa. It was composed in the year 1430, of an unspecified era.

9.—The *Lakshmí-nivásábhidhána*, by S'ivaráma Tripáṭhin, the scho-

goats, which he nourished. Whatever the absurdity of the story, it has its worth, to the maker of a mythological dictionary, in determining the correctness of a long syllable as against a short one. That the text is not depraved is presumed.

liast on the *Vásavadattá.* This is a collection of the *Uṇádi* derivatives, with definitions. It is said to have elicited a volume of annotations.

10.—The *Gaṇa-nighaṇṭu,* by Chandrachandana.

11.—The *Madana-vinoda-nighaṇṭu,* by Madana Pála. It was written before the middle of the fifteenth century. Like the last, it is concerned with the materia medica.

12.—The *S'iva-prakás'a,* by S'ivadatta, son of Karpuríya Chaturbhuja. The author annotates his own work, which bears date in the year 1599 of S'aliváhana. In subject, it is like the last.

13.—The *Dravya-ratnákara-nighaṇṭu,* possibly by an anonymous author. It cites the *S'iva-prakás'a.* This, too, is medical. The sole MS. which has been consulted is incomplete.

14.—The *Rája-vallabha,* by Náráyaṇadása. It treats of officinal substances. It has been printed at least twice, with a Bengálí translation.

Public Inscriptions at Lahore.—By Henry Cope, *Esq.*

Hureeke viâ Umritsur, 22*nd March,* 1858.

The Secretary of the Asiatic Society, Calcutta.

Sir,—Looking over some of my papers, I found copies of all the inscriptions in existence on the public buildings of Lahore, which had been carefully taken under my directions during my residence there, and as I believe they have not been published, and it is desirable to preserve all available records of the kind, I do myself the honor to forward them for publication in the Journal of your Society, if you think them worthy of the honor.

I have added a brief memoir of the several buildings from which they are taken.

I have the honor to be, Sir,

Your Obedient Servant,

Henry Cope.

No. 1.—Motee Mundur.

(Persian Inscription.)

Translation.—Completed in the twelfth year of the reign of the emperor, (the shadow of God, a Solomon in equity) Noor-ood-deen, Jehángeer Pádsháh, son of Jelal-ood-deen Akbar Pádsháh Gházee, A. H. 1020, under the superintendence of the least of his lowest slaves, Soondur Khan.

The palace, or fort of Lahore, was commenced by the magnificent Akbar, and many elegant fragments of the style, peculiar to his age, were to be seen before the barbarous improvements of an executive engineer demolished or defaced what the Sikhs had left when they became masters of Lahore. The design of Akbar was carried out by his son, and we may reasonably consider the date of the completion of the Motee Mundur, formerly Motee Musjeed, as the date of the completion of the palace. It corresponds with the year of our Lord 1614. Jehángeer made Lahore his capital for many years. He died in the Beembur hills; his remains were conveyed by Noor Jehan to Lahore, opposite to which at Shadera on the right bank of the Ravee, she raised the splendid mausoleum that still attracts numerous admiring visitors. (I have not given the inscription on Jehángeer's tomb, as it is recorded in the Asiatic Register by an English officer, name not given, who visited Lahore in 1808, and wrote a most interesting account of the town and of the Court of Runjeet Singh. He travelled from Hurdwar in the train of one of the Maharaja's wives).

The Motee Mundur was the "private chapel" of the palace, and used as such, till Runjeet Singh began to grow rich, when he selected it as a suitable place for the storing of his wealth in gold, silver and jewels. It is believed at one time to have contained treasure to the amount of two millions sterling. It is small, has been, since it was converted into a Treasury, surrounded by a strong wall, and has continued to do the duty imposed on it by the Sikh sovereign, ever since annexation. It boasts of the most beautifully chaste marble dome on any Muhammedan building I have ever seen, deeply scored with the marks of balls fired during the Sikh troubles, after the Máhárájah's death, from the Minars of the imperial mosque.

No. 2.—Hatipaur Gate of the Palace.

(Persian Inscription.)

Translation.—The king, a Jumsheed in dignity, a Solomon in reputation, whose court is in the seventh heaven, whose noble standard waves above the region of the sun, a second Sahib Kiran, "Sháh Jehán," who in justice and liberality surpasses Nousheerwán and Fureedoon,

Ordered a (Royal?) tower to be erected, which in height should be beyond measurement and conception, like unto the highest heaven.

In brightness, loftiness, and excellence such a tower never has been, and never will be seen under the sky. After its completion his sincere slave and pious disciple Abdool-Kareem, comprised the year of its erection in the following couplet:—

Like the empire of this all-powerful monarch who has an army equal to that of Jumsheed,

May this propitious and lofty tower ever remain free from injury.

(The date thus illuminated is the 1041st year of the Hijra, corresponding with A. D. 1631).

It would appear, from the above, that Sháh Jehán added a tower at the north-west angle of the palace, which, unless the "sincere slave" wrote in an unusually hyperbolic style even for a servant of the "king of kings" has entirely disappeared. The inscription, may, however, allude to the Sheesh Muhul with which the gate communicated by a tramp constructed for the use of the elephants who conveyed the ladies of the Harem to and from their apartments. The Sheesh Muhul is in the Sumun Bourj (Jasmine tower) certainly the most conspicuous part of the palace, and its decorations partake more of the style prevalent in the time of Sháh Jehán than those introduced by Akbar or Jehángeer.

No. 3.—The Imperial or Badshahee Mosque.

(Persian Inscription.)

Translation.—This mosque of Ab-ool-zuffur Mohee-ood-deen Mahomed Alumgeer Pádsháh, was finished in the year of the Hijra 1084, under the superintendence of the humblest of his slaves Fidáee Khán, Kokah.

Tradition ascribes a much older date to this edifice, built by the emperor Aurungzeb in A. D. 1673, during one of the few visits

he paid the Punjab. It differs from edifices of the kind by having four minars of lofty proportions at each corner of the spacious quadrangle, at the western extremity of which it stands, instead of two on the northern and southern walls, as in the Jumma Musjid of Delhi which it otherwise resembles. The gateway on the eastern side of the quadrangle now stands out isolated in handsome relief at the top of a noble flight of steps, facing the western entrance of the fort; prudential motives having removed the cloistering on either side so as to leave the terrace open to sight from the fort walls. The mosque served, for upwards of forty and odd years, as a magazine both to Runjeet Singh and the British Government, but the ordnance stores have, within the last three years, been removed into the fort, and the mosque restored to the Musalmáns of Lahore. Their gratitude might have assumed a painfully practical shape in 1857, had less vigorous councils prevailed than those which, on the 13th May in that year, saved the Punjab from an insurrection and a mutiny.

No. 4.—The Mosque of Wuzeer Khan.

(Persian Inscription.)

Translation.—Completed during the reign of Uboo'l-Moozuffur the second, Sahibi Kiran Sháh Jehán Bádsháh Gházee.

This sacred temple was founded by his devoted follower and esteemed disciple and old servant Wuzeer Khan, 1044, Hijra, A. D. 1634.

This is one of the most elegant buildings of Lahore, ornamented throughout in that beautiful tesselated style which the architects of those days borrowed from the Chinese (workmen were brought across the Himalaya to give it the true "Porcelain" character) and which the men of the present day cannot even imitate, much less equal. It has suffered very little at the hands of the followers of Nanuk, whose intolerance should have taught patience at least to the Mahomedan, though they desecrated its courts, and its pools by killing swine and sprinkling the walls with their blood.

No. 5.—A small tesselated Mosque near the Moochee Gate.

(Persian Inscription.)

Translation.—Zuhoor Bukhsh laid the foundation of this mosque, Mahomed Sálih completed it, A. H. 1072, (A. D. 1661).

Neither the names of Zuhoor Bukhsh or Mahomed Sálih are known to fame, nor recorded in history. The mosque is known as the "Cheeneeán-walee Musjeed."

No. 6.—The Golden or Tiláee Mosque.

(Persian Inscription.)

Translation.—Founder of this mosque Nujwaree Khán. *(No date)*.

This building has been made much more of by travellers than it deserves. It is small, advantageously situated on a high terrace at the bifurcation of two streets, but so surrounded by high houses that it can only be seen from a distance. Attached to it is a curious baolee of great depth, whence the best water in the town is procurable.

Henry Cope.

Hureeke viâ Umritsur, 22*nd March*, 1858.

No. 1.—Motee Mundur.

تاریخ بر دروازهٔ موتي مندر واقعه قلعهٔ لاهور

سال دوازدهم جلوس پیش بندگان حضرت شاهنشاه ظل الله سلیمان جاه عدالت پناه نورالدین جهانگیر بادشاه ابن جلال الدین اکبر بادشاه غازي یکهزار بیست سنه ۱۰۲۰ هجري باهتمام کمترین غلامانِ کهترین سندرخان صورت اتمام یافت

No. 2.—Inscription on Hatipaur gate of the Palace.

تاریخ بردروازه هاتهي پور

شاه جم‌جاه سلیمان‌قدر کیوان بارگاه   کزسپهر مهر برتر برده رایات جلال
ثاني صاحب‌قران شاه‌جهان کزعدل‌وجود   نیستش نوشیروان مانندوافریدون همال
شاه برجي حکم کرد احداث کز فرط علو   هست بیرون همچوعرش اعظم ازوهم وخیال
درصفا و رفعت و لطف برجي چندین*   ازحصارچرخ ننموده است وننمایدجمال
بنده یکدل مرید معتقد عبدالکریم   بعد اتمام عمارت یافت این تاریخ سال
دایما چون دولت این بادشاه‌جم سپاه   این همایون برج عالي‌باد ازآفت بےزوال

سنه هجري ۱۰۴۱

No. 3.—Inscription on the Imperial Mosque.

تاریخ بردروازه مسجد بادشاهي

لا اله الا الله محمد رسول الله

مسجد ابوالظفر محي الدین محمد عالمگیر بادشاه غازي سنه یکهزار هشتاد و چهار ۱۰۸۴ هجري باهتمام کمترین خانه زادان فدایخان کوکه اتمام یافت

No. 4.—Wuzeer Khan's Mosque.

تاریخ مسجد وزیرخان

* The metre of this line is defective,—a word is wanting before برجي —Eds.

در عهد ابو المظفر صاحب قران ثاني شاه جهان بادشاه غازي باني اتمام يافت
بيت الله ثاني فدوي باخلاص مريد خاص الخاص قديم الخدمت وزيرخان
سنه ۱۰۴۴ هجري

No. 5.—A SMALL MOSQUE NEAR MOOCHEE DURWAZA.

تاريخ مسجد چينيان والي متصل موچي دروازه
باني مسجد ظهور بخش بسعي محمد صالح صورت اتمام يافت سنه ۱۰۷۲ هجري

No. 6.—SONEREE MUSJEED.

مسجد طلائي
باني مسجد بخواري خان سنه ۱۱۶۳ هجري

Notes on the distribution of some of the land and freshwater shells of India: Part II.—BY W. THEOBALD, JUNR.

BIRMAH AND THE TENASSERIM PROVINCES.

(Continued from page 254).

FRESHWATER SHELLS.

Order. PROSOBRANCHIATA.

Family. MELANIADÆ.

Melania. Lam.

1. M. variabilis, Bens.—Birmah and Tenasserim provinces, passim. A very large and fine variety occurs in the Tenasserim river and is eaten by the Karens. A decollated specimen of *four whirls* measures 2.40 by 1.05.

A sharp pointed smooth variety is met with at Noung-ben-ziek, on the Irawadi near Prome which measures 2.50 by 0.86, number of whirls 10.

2. M. lirata, B.—Birmah and Tenasserim provinces, passim. This shell usually occurs of a small size in the Tenasserim valley. A very large variety is found in Pegu prominently studded with tubercles, length about 2.25, but I have no specimen to refer to Usual size of the common variety 0.90 by 0.45.

3. M. tuberculata, Mull.—Small and poor. A specimen from Thaiet-mio measures 0.90 0.26. A Bombay specimen 1.40 0.41.

4. M. spinulosa, B.—Tenasserim river. Very small and rare.

5. M. Jugicostis,* B.—Tenasserim river, rare. A doubtful species.

Paludomus.

6. P. Regulata,* B.—Common in marshy places and streams near Prome and Thaiet-mio. This is a sharp pointed shell, having little resemblance to the typical species of the genus.

7. P. labiosa,* B.—A small species tolerably abundant in the Tenasserim valley in running streams and the head waters of Tavoy Province.

8. P. ornata,* B.—Prome and the neighbourhood. Not a plentiful species.

Family, LITORINIDÆ.

Stenothyra. B.

9. S. Monilifera, B.—Mergui. In wet ditches.

Assiminea. Leach.

10. A. Francesiæ, Gray.—Maulmein, common.

Family. PALUDINIDÆ.

Paludina.

11. P. Bengalensis, Lam. Prome. Rangoon. Very common, and fine. A dark ferruginous stained variety is not rare at Rangoon. The Birmese shells, however, do not equal *some* Bengal specimens. A large specimen measuring 1.44 by 1.05, whilst a specimen from Benares measures 2.05 by 1.40.

12. P. Crassa, Hutton.—Thaiet-mio, rare and small.

13. P. Melanostoma.—Henzada. Rangoon. Common.

Bithinia. Gray.

14. B. Cerameopoma, B.—Ava, (procured by Mr. Oldham). Maulmein.

15. B. pulchella (?)—Maulmein.

Amphellaria. Lam.

16. A. Globosa, Swain.—Prome, very common. Maulmein. Tavoy.

Family. NERITIDÆ.

Neritina. Lam.

17. N. Humeralis,* B.—Salween river, within the tideway—of the type of N. reticularis.

NOTE.—New species described by Benson marked thus. *

18. N. Cryptospira,* B. Tenasserim river. This little species occurs abundantly on stones in rapids just above the tideway.

19. N. Fuliginosa,* n. s. mihi.—Testâ neritinæformi, subglobosâ, spirâ minimâ; colore luteo-flavescente rubro reticulatâ; intus flavescente-pallida; aliquando cærulescente; non raro fasciis duobus cincta in aperturâ facilius visis. Epidermide plerumque nigro colore, extraneo fucato; semipolita, operculo pallide aurantiaco, margine anteriore rubro. Longitudinis 0.40. Habitat in regno Burmanorum proper urbem Amrapoora sive Ava dictam. Teste, T. Oldham.

Order. PULMONIFERA.

Family. LIMNÆIDÆ.

Limnœa. Lam.

20. L. Succineus, Desh.—Prome, common.

Planorbis. Müll.

21. P. Coromandelicus, Fab.—Prome and Rangoon, &c. Common but not large.

Class. CONCHIFERA.

Family. ARCADÆ.

Scaphula. B.

22. S. Pinna,* B.—Tenasserim river within the tideway but in freshwater. This species appears to have been previously noticed and recorded as a Dreinnia in Mason's work on the Birmese Fauna, till I forwarded specimens to Mr. Benson, who described the species in the annals of Natural History for 1856. It adheres firmly by means of a short byssus to porous rocks (Laterite) in the cavities of which it nestles.

Family. UNIONIDÆ.

Unio. Retr.

23. U. cæruleus, Len.—Thaiet-mio in small streams and feeders of the Irawadi, not large or common.

24. U. crispisulcatus,* B.—Very common in small streams near Thaiet-mio, where it is eaten by the Birmese, 1.96—1.23.

25. U. Pugio,* B. Irawadi river near Ava. Procured by Mr. Oldham.

26. U. marginalis, Lam. ?—An allied species, if not a variety of this shell occurs near Prome, 4.30—2.00.

27. U. Parma,* B.—Common in the Irawadi and Tenasserim rivers, 2.56—1.90.

28. U. scutum,* B.—Common in the Tenasserim river, 3.90—2.05.

Family. Cycladidæ.

Corbicula. Muhlf.

29. C. Arata,* B.—Common in the Tenasserim river.

Family. Solenidæ.

Novaculina. Benson.

30. N. Gangetica, B.—Tenasserim river. This shell occurs in great quantities in mud banks within the tideway, but in freshwater, and is collected for food. My largest specimen measures 2.03—0.88.

The above is very far from being a complete list of the fluviatile shells of the Provinces, but is given in default of a better. Many species of shells are probably yet to be found, and I have a single valve of a large species from the Bangong Nulla near Thaiet-mio, which stream deserves attention.

Mhow, June 9th, 1857.

Darjiling and the Khasia Hills.

In endeavouring to contribute (from personal observation as far as practicable) to our knowledge of the distribution of land shells in India, I think it will prove convenient, not to say necessary, to divide India proper into three distinct regions, viz. the Himalayan, the Central and the Southern region—neither do I think these divisions will be found to be mere arbitrary ones, for though a few species may be common to all and a still larger percentage to any two, yet each is distinguished by a sufficient number of characteristic forms, to render such an arrangement not one of mere convenience, but essentially a natural one. In like manner Ceylon and the Tenasserim Provinces form two very natural divisions, and though I could wish that this subject had been taken up by one having greater experience than myself, yet, as a beginning, I venture to offer in the present paper, the results of my observations within the area which has fallen beneath my examination.

The Himalayan region has only been partly examined by me, and I shall therefore confine myself to its eastern portion, availing myself to some extent of the observations of my colleague Mr. W. Blanford, who obtained, when at Darjiling, several shells which had escaped my notice.

The central region commencing in the plains below the lower slopes of the hills, embraces the entire area outside the hills, drained by the Ganges and Máhánádi to the east, the Nurbudda and Taptee to the west, and the Indus and its tributaries to the north-west, a large and important area, but of a richness by no means commensurate with its extent.

Of the southern region, I know nothing personally, but the known shells of that quarter sufficiently support its claim to rank as an independent division.

Khasia Hills.

The shells which are here given have mostly been named and described by Mr. Benson, save in one or two instances, though many names are still merely manuscript ones, but for practical purposes I think a mere description unaccompanied by a figure of the shell is of little use in discriminating between nearly allied forms, though required by custom to establish the currency of the name applied to a new species.

Cyclostomidæ.

Pterocyclos, Benson.

No. 1. *P. Hispidus*, Pearson.—Teria ghât at the foot of the hills on the road to Cherra. This handsome species is very abundant on rocks at the limestone quarries a little above Teria ghât, where a dwarf variety also occurs sparingly. Diameter over peristome, 1.20.
Ditto in dwarf, 0.70.

2. *P. Albersi*, Pf.—Teria ghât. A dwarf variety.

Cyclophorus, Montfort.

3. *C. Siamensis*, Sow.—Teria ghât (the quarries). This very handsome species occurs abundantly. The apex is generally imperfect, probably from falling among rocks; as it is a heavy shell.

4. *C. Pearsoni*, B.—Lacat. Very common. Varies in size from $\frac{1.90}{1.50}$ to $\frac{1.20}{0.90}$

5. *C. Zebrinus*, B.—Nanclai Poonji on the northern water-shed of the Khasia hills, 92° 30′ east; 25° 15′ north. It is by no means an abundant species.

6.* *C. Tomotrema*, B. Teria ghât, rare. This shell is of the same type as the Birmese C. scissimargo.

7.* *C. Pinnulifer*, B.—Teria ghât. Not rare, varies from 0.60 to 0.30.

Leptopoma, Pfr.

8.* *L. Cybeus*, B.—Teria ghât, rare. Nanclai, rare. A thin shell of arboreal habits.

Alycæus, Gray.

9.* *A. Prosectus*, B.—Teria ghât; very common on rocks.

10.* *A. Hebes*, B.—Teria ghât, not rare.

Diplommatina, Benson.

11.* *D. Polypleuris*, B.—Nanclai. Not rare on rocks.

12.* *D. Diplocheilus*, B.—Teria ghât. A short species common on rocks.

Pupina, Vignard.

13. *P. Imbricifera*. B.—Teria ghât, rare. Found on rocks an decayed trees, but mostly on the latter. The operculum exhibits the spiral structure observable in Cataulus.

Hydrocena, Parryess.

14. *H. Sarrita*, B.—Teria ghât. Cherra, Nanclai, common on rocks and amongst moss on trees.

Helicidæ.

Helix, L.

15. *H. Plectostoma*, B.—Teria ghât, very common, a large variety is found on limestone rocks, a smaller one on trees, juvenile shells of this species are remarkably hirsute.

16. *H. Serrula*, B.—Teria ghât. Common. A beautiful diaphanous species with sharply chisselled striæ causing a toothed periphery. Reeve's figure conveys a poor idea of the shell.

17. *H. Delibrata*, B.—Teria ghât. Very rare. This shell extends to Birmah and when fine has a hirsute epidermis.

18. *H. Tapeina*, B.—Teria ghât and along the foot of the hills. This shell chiefly affects Areca palm trees. It is very closely allied to the Birmese H. rotatoria.

19. *H. Climacterica,* B.—Teria ghât. Not rare. A dwarf variety occurs at Cherra.

20. *H. Cestus,* B.—Beneath Cherra. Not very common.

21. *H. Decussata,* B.—Teria ghât, rare.

22.* *H. Bascunda,* B.—Teria ghât, rare.

23.* *H. Galea,* B.—Teria ghât, rare.

24.* *H. Diplodon,* B.—Teria ghât, rare.

25.* *H. Castra,* B.—Teria ghât, rare. A Darjiling species.

26. *H. Planiuscula,* Hutton.—Cherra, rare.

27.* *H. Puellula,* B.—Teria ghât, rare.

28. *H. Oxytes,* B.—Nanclai poonji,* rather common among limestone rocks.

29.* *H. Castor,* n. s. mihi.—Testâ lenticulari, subdepressâ, vix umbilicata, acute carinata, confertim striatâ ferrugine—fuscâ anfractibus 5½—6, magnitudinis 1.40—0.60. Habitat apud Nanclai, in montibus "Khasia" dictis.

This shell is not common, and I have only a barely adult specimen in good condition. It closely resembles H. oxytes which it accompanies, and from which it differs in its nearly closed umbilicus, and less ornate sculpture. The keel too is a trifle more acute and divides the body whorl in a symmetrical manner, from the shell not being so flattened down as H. oxytes. The shell is rather stout and the peristome probably thickened more or less.

30.* *H. Pollux,* n. s.—Testâ lenticulari, subdepressa vix umbilicata, acute carinata, tenue striatâ, translucente, colore stramineo, polita, peristomate acuto anpactibus 5½—6, magnitudini 1.40—0.55. Habitat prope Teria ghât, ad pedem montium Khasia dictarum.

This shell is a very distinct species of the same form as the above, from which it differs in sculpture, want of solidity and colour. As far too as I can judge, its habits are arboreal, whilst the last species affects rocks in company with H. oxytes.

A few more helices occurred, of the naninoid type, but not in a satisfactory state for determination, but the hills below the Cherra plateau offer a tempting ground for future exploration as the richness of the few spots examined near Teria ghât proves.

* Poonji = village.

Streptaxis, Gray.

31.* *S. Theobaldi*, B.—Nanclai. Rare; amongst limestone rocks.

Vitrina, Draparnaud.

32. *V. Gigas*, B.—Near Teria ghât, but at some elevation, and also at Cherrapunji, length of a large shell 1.45.

33.* *V. Scutella*, B.—Teria ghât, rare.

34.* *V. Salius*, B.—Teria ghât, rare. The animal is a livid plumbeous colour, addicted to limestone rock in the sinous cavities of which it is chiefly to be found. It is very active and when touched, leaps several inches by rapidly twisting and whirling its tail in a very vermiform manner, indeed till this habit is known, it is not easy to secure in the rough places it mostly frequents.

Bulimus, Scopoli.

35.* *B. Polypleuris*, B.—A pretty little scalariform species, of which a single specimen only was found at Teria ghât.

36. *B. Sylheticus*, B.—Not met with by me but included in Mr. Benson's list of Sylhet shells. It is found in the orange tree plantations at Lacat.

Achatina, Lamarck.

37.* *A. Pyramis*, B.—Teria ghât. Abundant under leaves and rubbish.

38. *A. Crassilabris*, B.—Teria ghât, rare.

39. *A. Cassiaca*, B.—Not found by me but included in Mr. Benson's list.

40. *A.* ——— sp. In too poor a state for description.

41. *A.* ——— sp. Ditto ditto.

Pupa, Lamarck.

42.* *P. Vara*, B.—Nanclai. Very rare.

43. *P. Plicidens*, B.—Cherra.—Very common on limestone rocks This is a Western Himalayan species.

Clausilia, Draparnaud.

44. *C. Loxostoma*, B.—Teria ghât. Very common, attached to rocks or stones. This shell differs much in appearance, being sometimes found entire and with clean epidermis, in others covered with green matter and decollated. This difference is the result of situation, those specimens taken from rotten trees and beneath the loose bark being perfect, whilst those attached in exposed situations

to rocks and boughs, being constantly moist for months together and generally with a drop of water pendent from the apex become decollated and covered with a green confervoid coat.

45.* *C. Ignota,* n. s.—Teria ghât. Rare, my two specimens at present in Mr. Benson's hands for description, so that the name here given is merely provisional. It is allied to C. cylindrica.

46. *C. Bacillun,* B.—Nanclai. Very rare. A new species but unfit for description, of the type of C. Insignis.

The freshwater shells may be dismissed in a few words, the most remarkable of them not being found by me. I allude to *Scapula celox,* which inhabits some of the streams in Sylhet.

Paludomus Stephanus, B. and *P. Conica,* Gray, occur at Teria ghât, the former in immense abundance.

Ampullaria also reaches a large size at Sylhet, one specimen of *A. Globosa,* measuring 3.45 by 3.18, the mouth being 2.41 by 1.40.

A very heavy Calcutta specimen being only 2.43 by 2.28, and the mouth 1.65 by 1.03.

A dwarf var. not rare about Calcutta, measures only 1.20 by 1.07.

Darjiling.

My present list of Darjiling shells, will, I regret to say, be found very meagre, owing to more than one cause over which I have no control. Since my visit to Darjiling, a large addition to previously known species, was made by Mr. W. Blanford, who has sent his unique specimens to England. Of the others, he has liberally furnished me with specimens, some of the most interesting of which I had described for insertion in the present paper, but at the last hour failed to obtain the donor's permission for so doing, the present list therefore embraces only published species, though it is to be hoped Mr. Blanford will himself soon remedy this, and adopt the course which his prohibition has debarred me from.

Cyclostomidæ.

Cyclophorus.

C. Himalayanus, P.—Not common.

C. Tryblium, B.—Rare.

C. Aurora, B.—Common. This shell varies very greatly in size

as the following measurements shew, 1.95—1.30 to 1.20—0.80, and smaller specimens than this last are not rare.

C. Phœnotopicus, B.—A small species of the pterocycloid group of Cyclophorus.

Megalomastoma.

M. Funiculatum, B.—Tolerably abundant at Darjiling on mossy banks.

M. (?) n. s.—A small pointed scalariform species with strong costulate striation.

Alycæus.

A. Urnula, B.

A. Constrictus, B.

A. Otiphorus, B.

A. Stylifer B.

A. n. s.

A. n. s.

A. n. s.

A. n. s.

A. n. s.

Streptaulus. B.

S. Blanfordi, B.

Diplommatina.

D. Pachycheilus, B.

D. sp.

HELICIDÆ.

Bulimus.

B. Sikkimmensis, Reeve. Rare.

B. (small sp.)

Achatina.

A. Tenuispira, B.

A. Crassula, B.

Clausilia.

C. Ios, B.

Pupa.

P. (sp.)

Vitrina.

V. (sp.)

Helix.

H. Cyclophlax, B.

H. Tugurium, B.—Rare.

H. Castra, B.—Rare.

H. Orobia, B.—Rare.

H. Lubrica, B.

H. *Huttoni*, B.

H. Rorida, B.—Common on shrubs in Darjiling during early morning.

H. Climacterica, B.

H. Plectostoma, B.

To this a dozen may safely be added to complete the list, of shells which are undescribed and of which I have not seen specimens.

Calcutta, 30*th August*, 1858.

Account of a Cyclone in the Andaman Sea, on the 9th and 10th April, 1858.—*By* G. von Liebig, M. D.

The *Friend of India* of the 13th May publishes the following notice: " *The Maulmain Advertiser* records a severe gale in the Bay of Bengal on the 9th and 10th of April and two preceding days. The shipping suffered considerable damage and the Brig *Dido* bound from Rangoon to Penang foundered at Sea; one man was saved, &c. &c."

Having been in the Andaman Sea about that time, doing duty on board the Honorable East India Company's Steam Frigate *Semiramis*, Capt. Campbell, which had left Calcutta on the 4th of March for the Andaman Islands and Maulmain, I had an opportunity of collecting some information with regard to this gale, a well defined Cyclone, the publication of which I think will be of importance for the navigation of the Andaman Sea. I consider the publication of this account the more in the light of a duty, as we have had only lately to regret the loss of Mr. Piddington, who has for a number of years conferred so much benefit on the navigation of the Indian seas by collecting facts illustrative of the laws of circular storms

and by popularising knowledge by which to avoid their dangers. I have no doubt that he would, with his large experience, have done better justice to the subject than I can hope to do, and I am happy to avail myself of this opportunity to pay tribute to his memory.

The Cyclone of the 9th and 10th April deserves particular attention as it followed a direction differing from the common course of Cyclones in the Bay of Bengal, or in the tropical latitudes generally on the northern hemisphere. This course is usually from the south of east to the north of west, but the Cyclone of the 9th and 10th travelled from the south of west to the north of east—(a direction which we are accustomed to see the Cyclones assume only after they have passed the northern tropic)—passing from the north end of the Andamans to the main land and touching the coast a little south-east of Cape Negrais.

In drawing up this account, I am in a great measure indebted to the kind assistance of Capt. Campbell, I. N., whose experience has guided me where I was deficient in nautical knowledge.

The *Semiramis* left Port Blair (11° 41′ north latitude, 92° 45′ east longitude) on the 7th of April for Maulmain. The wind had been blowing from E. N. E., E., and E. S. E. for the whole fortnight previous to our departure, conveying large summer clouds across the Island. On the 6th, the clouds thickened with much lightning, and occasional showers fell, and on the morning of the 7th, the sky was overcast and rainy. Soon after we had left Port Blair on the 7th, the wind turned to south-east with rain and squalls and lightning to southward, but on the morning of the 8th had changed to the north-east, the weather clearing a little. During the day it went to the north and west of north and in the night returned to north-east, from which quarter it continued until we approached Amherst, where we anchored at 1 P. M. on the 9th. Here the wind changed through E. to S. E. during the afternoon of the 9th, the squally weather continuing. During the night with much lightning to the south-east and south the wind increased considerably in force (from 4 to 8 and 9) turning to S. and blowing a gale on the forenoon of the 10th with occasional squalls of rain, but no increase of clouds or unusual electric phenomena during the day, blue patches of the sky being occasionally visible.

The *Semiramis* weighed anchor at noon and proceeded up the river to Maulmain, where she arrived at 2 P. M. The wind after midday gradually changed to S. W. diminishing in force. The readings of the barometers, having followed a most regular course since the day we had left Calcutta, showed on the morning of the 10th a remarkable irregularity. The barometrical curve of the 9th had still been regular, rising from 6 o'clock to 9 and 10, then falling till 4 and 5 P. M. and rising again in the evening. On the 10th the Mercury rose only till 8 o'clock, when it commenced to fall, being at 10 o'clock much lower than it might have been expected, and nearly 0.200 inches lower than the day before at the same hour. (For the observations on board the *Semiramis* as well as abstracts from the logs of the ships mentioned hereafter, vide Appendix.)

The mean barometrical pressure on the 10th (mean of hours 8 A. M. and 4 P. M.) was 0.15 inches lower than the mean of the 9th. On the 11th, the barometer rose again, nearly to its former height and returned to its regular course. The mean temperatures of both days (9th and 10th) were about the same, but with a greater variation on the 10th.

The concurrence of the low and irregular barometric pressure and the increasing force of the wind made it very probable that a Cyclone was passing near, of which we felt the extreme edge, the changes of the wind being slow and the general disturbance in the atmosphere not great. The change in the direction of the wind having taken place from S. E. by S. to S. W. would indicate a position in the right semicircle of the Cyclone, its centre having been nearest on the forenoon of the 10th. A few days after our arrival at Maulmain, we obtained the confirmation of this conjecture.

On the 12th, the survey brig *Mutlah*, Lt. Sweney, I. N. came in, having been obliged to quit her station opposite the middle Andaman in consequence of bad weather, on the 8th April. The *Mutlah* had the first indication of bad weather on the 7th when at anchor in Diligent Straits (vide Appendix). The wind which had before been blowing E. N. E. and E. S. E. the same as at Port Blair, changed on the 7th to S. E. with squalls and rain in the evening. It will be remembered that the *Semiramis* experienced the same change on the same day and in about the same longitude or rather

more to the eastward but further south. On the 8th the gale increased, the wind veering to S. S. E. The Brig now left her anchorage and ran before the gale, standing N. E., the force of the wind still increasing and blowing furiously on the forenoon of the 9th from S. On the 10th the force of the gale moderated, the wind veering to S. S. W. and S. W., the Brig running for the Maulmain river. The barometer continued to fall from the 7th, and was lowest on the 9th.

On the 10th it rose again. According to the veering of the wind the *Mutlah* was also in the right semicircle of the Cyclone and by the barometer nearest to its centre on the 9th, the centre bearing west. Judging from the violence of the weather she experienced, she must have approached it much nearer than the *Semiramis.* She met the gale two days earlier than the *Semiramis,* and further west.

Although the observations of the two Ships coincided so far, it was a strange circumstance that in these latitudes (15° to 17° N.) a Cyclone should travel in the direction indicated, namely, from west to east, the common course of Cyclones in these latitudes being from east to west, and confirmation was still required of the nature of the storm having been that of a Cyclone.

This was given by the Mail Steamer, *Cape of Good Hope,* which experienced bad weather on the 9th, passing along the Arracan Coast from Akyab to Rangoon. With her, the Cyclone set in from the east about noon near Cheduba, the wind increasing and veering round to N. E. and the sympiesometer falling. The violence of the storm was greatest and the sympiesometer lowest about and after midnight, wind N. when she was about forty miles N. W. of Cape Negrais. After this the wind changed to N. W. the storm moderated and ceased at noon on the 10th. The Ship arrived at Rangoon on the evening of the 11th with fine weather.

The wind having commenced with E. veering by N. to W., the *Cape of Good Hope* was evidently in the left semicircle of the Cyclone, and nearest its centre about midnight, on the 9th the centre bearing E.

On the morning of the 9th, when approaching Amherst we had sighted the ship *Alma* on her way from Amherst to Port Blair. She passed us with N. E. wind which she kept till late in the afternoon.

At 9 P. M. a squall from S. E. blew away her main top sail ; at midnight the wind came from S. with terrific squalls, thunder and lightning, the gale blowing till noon on the 10th, when it moderated with S. W. On the 11th the weather was fair with light airs from the westward. The *Alma* in the right semicircle of the Cyclone had been driven N. Westward into the gulf of Martaban, where she had the worst of the storm at midnight from the 9th to the 10th, the centre bearing west, at a time when Amherst partook only of the changes of the wind without experiencing the violence of the gale. From the observations of the *Alma* and the *Cape of Good Hope* it is possible to fix the centre of the Cyclone at midnight on the 9th. Judging from the great violence of the gale at Port Dalhousie where the storm is said to have been worst, it was about forty or sixty miles E. N. E. off Cape Negrais on the main land (vide Charts).

The Honorable East India Company's Steamer *Coromandel* bound for Madras, left Rangoon on the 8th with N. and N. E. wind and rain. She kept the usual course and in 15 latitude, A. M. on the 9th she steamed westward. The Cyclone commenced at 11 A. M. on the 9th, the wind changing from N. to S. E. barometer 29.96. She soon changed her course to W. by N. and W. N. W., the wind veering to E. S. E. at 1 P. M. increasing fast and barometer falling. At 4 P. M. the Ship was a little north of Preparis Island, the wind had suddenly changed to N. N. E. increasing to a heavy Cyclone with thunder and lightning and heavy rain. The barometer falling rapidly, but the urgency of the occasion not leaving time to record the observations.

The Ship now hove to with her head to E. ; much damage was received (vide Appendix). The gale continued heavy, the wind veering to N. W. until 7 P. M. when an observation of the barometer could again be recorded, which was very low 29 20. After that hour the weather moderated, the wind drawing to the westward and the barometer continued rising. It was at 10 P. M., 29.49. From the great violence of the storm experienced about 4 P. M. the sudden change of the wind to the northward, and the rapid as well as great fall of the barometer, the *Coromandel* must have been close to the centre of the Cyclone about that time.

The Cyclone had struck the Ship first with S. E. the same as was the case with the *Mutlah* and *Alma*, but at a later date and to the east of the former, and earlier and to the west of the latter, the *Coromandel* being in a position between these two Ships. This confirms the view already taken of the Cyclone passing from S. W. to N. E. The *Coromandel* instead of passing through the right semicircle of the Cyclone, as the other ships, must have steered right across its tract into the left semicircle, narrowly escaping the centre itself. That she was closer to the centre than any of the other ships is proved, as already mentioned, by the rapid changes of the wind between 1 P. M. and 7 P. M. from E. S. E. to N. W. The observations of the *Coromandel* allow us to fix the centre to about 20 or 40 miles north of Preparis Island at 4 P. M. on the 9th, and its passage to the main land between that hour and midnight is shown by its position at midnight which we have fixed from the observations of the *Cape of Good Hope* and the *Alma*.

We are now also enabled to trace the position of the centre at noon on the 9th. The *Coromandel* had at that time the wind from S. E., the centre bearing S. W. At the same hour the *Mutlah* had the wind from S. the centre bearing west. Proceeding from the positions of the two ships at noon on the 9th these bearings unite in fixing the centre to about ten miles north of the little Cocos Island (vide charts.) This agrees well with the observations of the *Cape*, the wind about noon near Chiduba being east.

It now remains to trace the positions of the centre at noon on the 10th. At that hour, the *Alma* in the Gulf of Martaban, very near the coast had S. W. when the *Cape of Good Hope* about 40 miles S. west of Cape Negrais had N. W. The bearings of the centre from these directions of the wind point to a position about 40 or 60 miles to the North of Rangoon, on the main land. This is further confirmed by the change of the wind about noon at Amherst from S. to S. W., I have delineated the tracks of the ships and that of the storm on the 9th and 10th on the two accompanying charts.

By information received, the storm was not felt at Akyab, but its widest circle about noon on the 9th touched Chiduba Island and shortly after that hour Amherst, where I take the change of the

wind to S. E. and its subsequent veering by S. to S. W. as sufficient evidence. Starting from the position fixed for the centre at noon on the 9th near the Cocos Islands, this would give it a radius of about 300 miles. On the 8th when it commenced, probably a little W. of the *Andamans*, it was felt at Port Blair.

Having fixed the centre for noon of the 9th for the midnight following and for noon of the 10th, we are enabled to form a conclusion as to its rate of travelling and the difference of its speed on the surface of the Sea and on the land. In the period from noon to midnight on the 9th, the centre accomplished a distance of about 160—170 miles and in the 12 hours following about 90—100 miles. Accordingly it travelled at the rate of about 14 miles an hour on the water and of about 8 miles an hour on the land.

The track of the Cyclone does not keep a straight line but is slightly curved, the concavity of the curve pointing to the south-east.

For determining the position of the centre, I have only used such positions of the ships as could be defined with sufficient approach to their real place, as otherwise the uncertainty of some parts of the ship's tracks and also of the observation of the wind's changes when further removed from the centre, would often lead to error.

To complete the information, I mention that by a letter which Capt. Dicey, Master Attendant at Calcutta, had the kindness to communicate to me, the Cyclone caused considerable damage at Henzadah latitude 17° 40′ N. and longitude 95° 15′ E. on the forenoon of the 10th, when its centre passed between that place and Rangoon. The destruction caused at Rangoon was also great, as I conclude from verbal accounts, but it is to be assumed that the violence of the Cyclone must have been considerably lessened by the time it had progressed so far inland. This would also appear from the small disturbance of the atmosphere experienced at Amherst and Maulmain on the 10th.

It will be interesting to mark the limits of the region in which the Cyclone raged, and the winds that prevailed in these limits before and after it.

The region in which the effects of the storm were felt may be included between the 11th and 19th degrees N. latitude and between

the 92° and 98° E. longitude. There is no doubt it must have extended to the west of 92° E. longitude on the 8th and 9th, but, no observations being available, I will not go beyond that limit. In this region the polar current prevailed before the commencement of the gale, as shown by the observations of the *Semiramis*, Port Blair and *Mutlah* before the 7th and of the *Alma* and *Coromandel* on the 8th (Amherst and Rangoon, vide Appendix.) On the 7th and 8th a south-eastern current from the equator first entered the south-western quarter of the region between 93° and 95° latitude. (*Semiramis* and *Mutlah* on the 7th) at a time, when in the eastern half the polar current still prevailed (*Semiramis*, *Coromandel* and *Alma* on 8th.) The entrance of the southern current seems to have introduced the atmospheric disturbance, but the rotatory motion was not observed before the 9th and 10th, when the Cyclone had been formed, travelling now from S. W. to N. E. The *Mutlah's* log makes it probable that the Cyclone took its origin west of the middle Andaman on the 8th.

After the Cyclone had passed, the prevailing winds in the region were westerly, with calms, and later the polar current prevailed again.

To the south-west of the region (latitude 6° 10′ longitude 88°—90° ship *Edwards*) on the 8th and 9th S. westerly winds prevailed, giving way on the 10th to the polar current.

To the north of the region (Dalhousie, Calcutta and Sea and *Cape of Good Hope*, forenoon of 9th.) The S. W. sea breeze common to the coast of Bengal and Arracan, prevailed before as well as after the gale (Dalhousie, Calcutta to 16° 51′ N. latitude and 92° 16′ E. longitude from 7th to 11th.) The log of the *Edward* shows that the south-eastern current, which ushered in the Cyclone, was confined between very narrow limits, not reaching west of the Andamans. It was on the 7th probably confined between longitude 92° and 95° or 96° east longitude.

Appendix.

Memo. from the Log of H. East India Company's Steam Frigate or Semiramis, Capt. Campbell, *and also private Journal.*

6th April.			
7 A. M. Bar.	29.965	84.00	At Port Blair, sky overcast,
10	30.030	85.00	wind E. S. E., calm in evening.
12	30.015	85.75	
2 P. M.	29.975	86.25	
4	29.945	86.25	
6	29.925	86.25	
8	29.940	85.75	
7th April.			
6-30 A. M.	29.910	85.0	Left Port Blair at 6 A. M., much
8	29.935	83.5	rain during the night with thun-
10	29.970	83.0	der and lightning, wind was
4 P. M.	29.850	82.0	E. N. E. in the morning, changed
6-25	29.850	82.0	in the middle of the day to S. E.
8	29.910	82.0	and remained so till evening,
			when it was E. S. E., strength of
			the wind 4—5; much rain with
			squalls all day. Ports closed since
			9 A. M., ship rolling.
8th April.			
6-30 A. M.	29.350	83.75	At midnight the wind lulled
10	30.005	80.75	and then set in from N. E. In
2 P. M.	29.940	81.25	the middle of the day it changed
4	29.940	81.25	from N. E. to the west of N. and
6	29.940	82.00	returned to N. E. in the evening,
8	29.960	81.75	strength 2—4, raining and over-
			cast all day with some lightning.

Latitude, at noon on 8th 14° 30′ N. by account.

Longitude, ... 96° 10′ E.

9th April.			
6-30 A. M.	29.975	80.5	During the night wind continued N. E. until about 7 A. M., after that hour it turned easterly and about noon became S. E. strength 3—4. At noon we took the pilot on board in sight of Amherst and anchored at 2 P. M., raining with interruptions all day; during the night following the 9th, lightning was observed all round, but principally to S. E. and S.
9	30.040	80.75	
10	30.040	81.0	
12	29.980	81.0	
2 P. M.	29.940	81.5	
4	29.925	81.5	
6	29.920	81.0	
8	29.950	80.5	

Latitude at noon on 9th 16° 4′ N. by account.
Longitude,.......... 97° 35′ E.

10th April.			
7 A. M.	29.860	78.00	The wind after midnight of the 9th changed from S. E. to S. and remained so, increasing in strength (8—9) till about noon, when it diminished, the wind gradually changing in the afternoon to S. W., left Amherst at noon and anchored Maulmain about 2 P. M., raining with interruptions all day.
8	29.900	78.50	
10	29.870	80.50	
11	29.875	81.75	
12	29.850	81.00	
2 P. M.	29.830	84.50	
4	29.805	78.50	
6	29.815	79.00	
8	29.800	79.00	
11th April			At Maulmain, wind S. W. and calm, clouds from N. W.

Memo. from the log of the Brig Mutlah, Lt. SWENEY, *I. N.*

	Aneroid Bar.	Temp.	
7th April.			
4 A. M.	30.00	84.5	At anchor off North Button, Diligent Straits (middle *Andaman.*) Overcast, slight showers, wind from E. N. E. in the morning turned after 10 A. M. towards S. E. strength increasing as it changed from 2—7 and 9, squally in the evening.
10	30.02	83.5	
1			
4 P. M.	29.93	82.5	
10	29.98	81.5	

8th April.			
4 A. M.	29.90	83.25	Gale increasing,incessant rain, left the Anchorage to gain the open sea, run before the gale, standing to N. E. wind S. S. E. the whole day strength 5—8.
10	29.94	84.00	
4 P. M.	29.87	83.75	
10	29.90	84.00	
9th April.			
4 A. M. no obs.		„	About midnight of 8th, heavy squalls, torrents of rain, course N. E., wind changed to S., at daylight of 9th stood E. by N. to steer clear of the Cocos and Preparis, and steer out of gale, wind S. 8 A. M. gale increasing, blowing furiously, torrents of rain and high sea, vessel labouring and straining. Noon slightly moderating, wind S. stood E. N. E.
10 no obs.		„	
4 P. M.	29.79	81.75	
10 no obs.		„	
10th April.			
4 A. M. no obs.		„	At midnight of 9th, heavy sea gale, heavy squalls, moderating after daylight, wind turning to S. S. W. and in afternoon to S. W., moderating; strength of wind during the morning 7—8 and 9, at 4 P. M. 3. Running for Maulmain river, ½ past 1, struck soundings 16 fathoms, sand. 10—30 P. M. anchored in 15 fathoms with Island a head (Calegouk.)
10 A. M.	29.93	82	
4 P. M.	29.89	82.5	
10	29.74	83	

Latitude at noon on 10° 15′ N.
Longitude, ... 96° 34′ E.

2 X

11th April.

4 A. M.	29.88	80.5	Under weigh to Caligouk Is-
10	30.00	81	land 3—4 miles E., wind N. west-
4 P. M.	29.94	82.75	erly, clearing up at noon, sighted
10	30.02	84	Amherst Pagoda.

Remark.

The tempest was worst on the morning of the 9th.

Memo. from Log of the Mail Steamer Cape of Good Hope, Capt. ROBERTSON.

9th April.—Proceeding down the coast from Akyab to Rangoon, wind S. W. on the morning of the 9th.

Noon.—Wind E. or E. S. E. threatening appearance, Sympiesometer, 29.95.

2 P. M.—Off Chiduba Island, wind E., barometer 29.90.

8 P. M.—Wind N. E. gale, sympiesometer falling 29.70.

Midnight.—About 40 miles N. W. of Cape Negrais, wind N. sympiesometer 29.49, heavy gale, thunder and lightning, squalls and rain, deck furniture carried away.

10th April.—About 50 miles west of Cape Negrais, wind has gradually changed to N. W. sympiesometer commenced to rise.

Noon.—Passed Negrais channel, wind N. W. moderating.

Remarks.—The gale was most severe shortly after midnight. It ceased in the afternoon of the 10th. The wind veering to W. N. W. and remaining westerly and N. westerly afterwards. Fine weather on the 11th, arrived at Rangoon on the 11th at night. At Port Dalhousie, the cyclone had been worst, two ships were lost on the 9th. At Bassein, also great destruction was caused by the cyclone.

I am indebted for this account to the verbal communication by Capt. Robertson.

Memo. from Log of ship Alma, Capt. D. RITCHIE *from Amherst to Port Blair.*

8th April.—At Amherst, a strong breeze from N. W. until about midnight, when it veered to N. E.

9th April.—Left Amherst at 9 A. M., wind N. E., remained so until night.

9 P. M.—A sudden squall from S. E., blew away the main top sail, it moderated again.

Midnight.—Terrific squall from S., with thunder and lightning, gale lasted until noon.

10th April.—Noon when it moderated with S. W. course from midnight until noon undecided N. W. or W. The ship drifted until she had only 8 fathoms of water muddy.

11th April.—Gale ceased, wind coming round to the westward, light airs at noon.

Latitude 11th at noon 15° 5′ N.
Longitude, ... 96° 7′ E.

12th April.—Light airs from the westward, fine weather continued until arrived at Port Blair on 19th.

I am indebted for this account to the verbal communication of Capt. Ritchie.

The track of the *Alma*, as in the chart, was kindly laid down for me by Capt. Campbell, with special regard to drift and local tide currents.

Memo. from the Log of Honorable East India Company's Steamer Coromandel, Lt. STRADLING, *I. N.*

8th April.—Left Rangoon, wind North, rain.

4 P. M.—Left Rangoon Bar. Gloomy, and rain N. E. 3.

Midnight.—Wind North, rain.

9th April, 9 A. M.—Heavy squalls, confused sea, wind N. E. to N. barometer 29.94.

Thermometer 81.

11 A. M.—Cyclone first struck ship steaming to westward, wind S. E. 6, heavy sea, confused barometer 29.96, rain and gloomy.

Noon.—Latitude 14° 59′ 30″ N., longitude 94° 15′ E. by account.

1 P. M.—High sea from south rolling heads, washed away boat, wind increasing, E. S. E. barometer 29.59, thermometer 82.5, steaming W. by N. and W. N. W.

4 P. M.—Wind N. N. E. increasing fast, heavy cyclone, squalls, with heavy rain, thunder and lightning, barometer falling rapidly. Hove to with head to eastward, sails blown away.

7 P. M.—Wind N. N. W. blowing furiously, cross sea, squally and rain, barometer 29.20 lost jib boom and 24 pr. gun.

10 P. M.—Wind drawing to westward, vessel shipping seas fore and aft, barometer 29.49.

Midnight.—Lost sails, blown away, furled. Barometer rising, slightly moderating.

10*th April*, 4 A. M.—Stood S. W. ward, shipped heavy sea from S. E., ship rolling heavily, wind N. W. to W., passed ship standing to eastward.

Variable winds to westward all the 10th.

Remarks.

Gale was strongest at 4 P. M. on 9th, with wind suddenly increasing to north, barometer falling rapidly till 4, then rising, moderated at 2 A. M. on 10th, confused sea all forenoon. Capt. Campbell had the kindness to procure this memo. for me, and also to lay down the track of the *Coromandel.*

Memo. from Log of Honorable E. India Company's Steamer Dalhousie, Lt. HELLARD, *I. N. from Calcutta to Port Blair.*

7*th April.*—River Hooghly at Calcutta, weather fine, winds variable, barometer at 9 A. M. 29.90 Temp. 83.

8*th April.*—River Hooghly at Calcutta, wind westerly and northwesterly, weather fine, barometer at 9 A. M. 29.96 Temp. 82.

9*th April.*—Proceeding down the river, wind westerly 2—4 barometer 30.00 Temp. 83.

10*th April.*—At 1—30 P. M., the Pilot left the ship, winds between W. and S. 4. Barometer at 9 A. M., 29.97 Temp. 85.

At noon of 10*th.*—Latitude 18° 51′ N. longitude 89° 59′ E.

11*th April.*—Wind S. S. W. 3—4 fine, barometer at 9 A. M. 29.96 Temp. 83.

At noon.—Latitude 16° 52′ N. longitude 92° 16′ E.

12*th April.*—Calm, latitude 14° 36′ N. longitude 93° 41′ E.

Memo. from Log of Ship Edward, from Kurrachee to Port Blair.

7*th April.*—At noon latitude 7° 13′ N. longitude 88° 31′ E., wind northerly and variable with calm.

8th April.—At noon latitude 7° 34′ N. longitude 89° 1′ E. winds S. W., steady breeze and fine.

9th April.—At noon latitude 8° 28′ N. longitude 90° 52′ E. winds S. W. and W. S. W., fresh breeze and cloudy.

10th April.—At noon latitude 10° 23′ N. longitude 92° 40′ E. sighted little Andaman at 8 A. M., wind N. W. all day, fine and steady.

Memo. of observations at Chatham Island, Port Blair, Barometer. By Dr. Gamumer.

	7th April.		8th April.		9th April.		10th April.	
	Bar.	Wind.	Bar.	Wind.	Bar.	Wind.	Bar.	Wind.
Sunrise.—	29.82,	Easterly.	29.77,	South.	29.73,	S. W.	29.86,	W.
10 A. M.—	29.82,	N. E.	29.79,	S.	29.83,	S. W.	29.88,	W.
4 P. M.—	29.82,	N. E.	29.77,	S.	29.83,	W.	29 92,	W.
Sunset.—	29.80,	E. N. E.	29.77,	S. W.	29 85,	N. W.	29.92,	N.W.

Remarks.—It commenced to blow head at midnight, following the 7th. The position of Chatham Island being confined within the harbour, the indications will not follow the smaller changes in the open sea, but for the greater alterations in the directions of the wind, they are sufficiently close.

On Hypsometrical Measurements by means of the Barometer, and the Boiling-point Thermometer.—By James Burgess, Esq.

The whole subject of the barometrical measurement of heights has been investigated by so many eminent physicists since the time of Pascal and Descartes, that it is not to be expected that much that is new can now be added to the theory. The object of this paper is—(1) by correcting the constants used in the latest development of the usual formula, according to the most recent and trustworthy experiments, to render the results obtained in practice as accurate as possible; and,—(2) to deduce formulæ and tables for facilitating the computation of heights by means of the temperature of boiling water, which shall give results more in accordance with the truth than the tables hitherto employed.

I.—*Barometrical Measurements.*

1. The most recent and complete investigation of the theory of the measurement of heights by aid of observations with the barometer, is that of Bessel in the *Astronomische Nachrichten.** This formula may be written in a general form, thus :—

$$\text{Log}\,\frac{P}{P'} = \frac{(g)(h'-h)}{L\ (1+at)}\left\{1-\alpha.\frac{(1-d)\,p}{\sqrt{P\,P'}}\right\}$$

where—

P is the weight or pressure of the atmosphere at the lower station, and P′ that at the upper, the unit of pressure being that exerted by a column of mercury of 336.905 Paris lines or 29.9218 English inches at the sea-level in latitude 45°.

h is the approximate height of the lower station, and h' of the upper, above the level of the sea; so that if H, and H′ respectively represent the true altitudes of the stations and r the radius of the earth, then—

$$h = \frac{r\,H'}{r+H}, \text{ and } h' = \frac{r\,H'}{r+H'}.$$

(g) is the ratio of the force of gravity at the sea-level in the latitude λ, of the two stations to that at the sea-level in latitude 45°.

α, denotes the fraction of mean saturation of the stratum of air between H and H′, and taking the fractions of mean saturation at the two stations, we may use for that of the stratum $\frac{1}{2}\,(\alpha + \alpha'.)$

a is the co-efficient of dilatation of the air for an increase of 1° of temperature, t denotes the mean temperature of the stratum reckoned from freezing point.

d is the density of vapour in terms of that of air ;

P, the tension of vapour of the temperature t. And

L, a constant dependant on the relative density of the air and of mercury.

2. But, in order to obtain accurate results by means of this formula, it is of importance that the constants should be determined as accurately as possible.

* See Schumacher's Ast. Nach. No. 356. Taylor's Mem. Vol. II.

Now (g), which depends on the variation of gravity between the equator and the poles, has the form—

$$(g) = 1 - \tfrac{1}{2}\, n \cos. 2\, \lambda.$$

where n is $\frac{5}{2}$ times the ratio of the centrifugal force to gravity at the equator, diminished by the ellipticity of the earth. Slightly different values have been deduced by different philosophers for the value of n,* but with Bessel we may adopt—

$$\tfrac{1}{2}\, n = 0.0026257\,;$$

and consequently we have

$$(g) = 1 - 0.0026257 \cos. 2\, \lambda.$$

3. The constant L is the most important, and depends on the density of the air in terms of that of mercury; thus, B being the standard height of the barometer at the level of the sea in latitude 45°; D, the density of air under the pressure B of mercury in terms of the density of mercury, and M the modulus of the common logarithms—

$$L = \frac{B}{D\, M}.$$

Bessel, in determining the value of L, has derived it from the experiments of Arago and Biot on the weight of air, whence he finds

$$D = \frac{1}{10466.8}.$$

Ritter, however, has shewn that according to Regnault's experiments, the weight of a litre of air containing the average amount of 0.0004 of its volume of carbonic acid and under a pressure of 760 mm. of mercury is 1.2934963 gramme.† Now the latitude of the college in Paris is 48° 50′ 14″, and the height above the sea is

* If for the ratio of the centrifugal force to gravity we adopt the value $\frac{1}{289.4}$, and Bessel's value of the ellipticity $\frac{1}{299.15}$ we have $n = \frac{5}{2} \cdot \frac{1}{289.4} - \frac{1}{299.15} =$ 0.0052964, or $\frac{1}{2}\, n = 0.0026482$; Laplace, Gauss and Littrow used for $\frac{1}{2}\, n$ the value 0.002845; Poisson (Traité de Mécanique 2nd ed.) gives $\frac{1}{2}\, n = 0.002588$; Sabine from his pendulum experiments infers that $\frac{1}{2}\, n = 0.0025914$; and Baily (Mem. Ast. Soc. vol. vii. p. 94) gives .0025659.

† Memoires de la Société de Physique de Genève, tom. iii. p. 361.

60 metres. And Poisson has shewn* that the force of gravity at the height z above the mean level of the sea is—

$$\left\{1-\left(2-\frac{3\,\rho'}{2\,\rho}\right)\frac{z}{r}\right\}\times \text{force of gravity at the sea level;}$$

where ρ' is the density of that part of the earth above the mean level of the sea, and ρ the mean density of the earth. Hence the weight of a litre of dry air at the level of the sea, in latitude 45° under a pressure of 29.9218 inches is—

$$1.2934963\div\left\{\left(1-1.32\frac{z}{r}\right)\left(1-.0026257\cos 97^\circ\,40'\,28''\right)\right\}$$

$$=\frac{1.2934963}{1.00033847}=\overset{\text{gr.}}{1}.2930586.$$

Now, if we take the standard height of the English barometer as 30 inches, we have for the weight under that pressure at 32° Faht.;—

$$\text{As } \overset{\text{in.}}{29}.9218 : \overset{\text{in.}}{30} :: \overset{\text{gr.}}{1}.2930586 : \overset{\text{gr.}}{1}.296438.$$

But the weight of a litre of mercury is $\overset{\text{gr.}}{13596}$, and hence,—

$$D=\frac{1296438}{13596}=\frac{1}{10487.2},\dagger$$

and since $\overset{\text{in.}}{30}=2.5$ feet and $M=0.43429448$, we have,—

$$L=\frac{B}{D.\,M}=\frac{2.5\times 10487.2}{0{\cdot}43429448}=60369.15 \text{ feet.}$$

4. a, or the co-efficient of the dilatation of the air has usually been taken from the experiments of Gay Lussac, who found the expansion between the freezing and boiling point of water to be 0.375 of its volume at 32° Faht.; Rudberg found 0.3648; Magnus 0.365508;

* Poisson, Traite de Mecanique, tom. ii. p. 629.

† Under a pressure of 29.9218 in., $D=\frac{1.2930586}{13596}=\frac{1}{10516.46}$, or $\frac{1}{472}$ part of itself less than Bessel's value; and $L=\frac{2.49304}{D\,M}=60369.15$ feet as above.

and Regnault 0.36706. Adopting 0.367 as the total expansion between 32° and 212° Faht. we have for 1° Faht.—

$$a = 0.0020389.$$

5. The value of d, or the density of aqueous vapour in terms of that of the air, used by Bessel was 0.62 as found by Berzelius; Regnault's experiments give 0.621 as a more accurate determination, and hence $1 - d = 0.379$.

6. Again p, the pressure of aqueous vapour in terms of that of the atmosphere at the temperature $t°$ reckoned from freezing point, may be determined by Regnault's formula, or from any table calculated by means of that formula.

In the usual tables of tensions computed from Regnault's formula, the tensions are expressed in inches of mercury,* and if we put p' for these values we have—

$$p' = 29.9218\, p.$$

7. Lastly, the geometrical mean of the two semidiameters of the earth, according to Airy† is

$$r = 20{,}888{,}733 \text{ feet.}$$

8. Now if B and B′ be the heights of the barometer at the lower and upper stations reduced to 32° Faht.—

$$\mathrm{P} = \frac{\mathrm{B}}{30} \times (g) \left(\frac{r}{r + \mathrm{H}}\right)^2, \text{ and } \mathrm{P} = \frac{\mathrm{B}'}{30} \times (g) \left(\frac{r}{r + \mathrm{H}'}\right)^2;$$

and since h is nearly equal to H,—

$$\mathrm{Log}\,\frac{\mathrm{P}}{\mathrm{P}'} = \log \frac{\mathrm{B}}{\mathrm{B}'} + \frac{2\,\mathrm{M}\,(h' - h)}{r};$$

and with sufficient accuracy for our purpose—

$$\sqrt{\mathrm{P}\,\mathrm{P}'} = \frac{\sqrt{\mathrm{B}\,\mathrm{B}}}{30}.$$

* See a Table of this kind in Dixon's Treatise on Heat, p. 257—260.

† See Herschel's Outlines of Astronomy, sec. 206.

Substituting these values in the formula, we have

$$\operatorname{Log}\frac{P}{P'}=\frac{(g)\,(h'-h)}{L\,(1+at)}\left\{1-\alpha.\,\frac{0.379\,p'}{\sqrt{P\,P'}}\right\},\text{ and—}$$

$$\operatorname{Log}\frac{B}{B'}=\frac{(g)\,h'-h)}{L\,(1+at)}\left\{1-\frac{2\,M.\,L\,(1+at)}{(g)\,r}-\frac{\alpha\,0.379\,p'}{\sqrt{B\,B'}}\right\}.$$

Replacing α, by $\dfrac{\alpha+\alpha'}{2}$, and introducing the values of 2M, L, and r, in the factor within the parenthesis, this equation becomes

$$\operatorname{Log}\frac{B}{B'}=\frac{(g)\,(h'-h)}{L\,(1+at,)}\times$$

$$\left\{\frac{(g)\ 20888733-52436\,(1+at)}{20888733\ (g)}-\frac{0.1895\,p'.\ \alpha+\alpha'}{\sqrt{B\,B'}}\right\},$$

and without any sensible error,—

$$\operatorname{Log}\frac{B}{B'}=\frac{(g)\,(h'-h)}{L\,(1+at)}\left\{\frac{397.37-at}{398.37}-\frac{(\alpha+\alpha').\ 0.1895\,p'}{\sqrt{B\,B'}}\right\}$$

$$=\frac{(g)\,(h'-h)\,(397.37-at)}{398.37\,(1+at)\,L}\left\{1-\frac{(\alpha+\alpha').\ 75.49\,p'}{(397.37-at)\,\sqrt{B\,B'}}\right\}$$

Hence, we have for the approximate height,

$$h'-h=(\log B-\log B')\times\frac{398.37\,(1+at)}{397.37-at,}L\times\frac{1}{(g)}\times\frac{1}{1-\dfrac{\alpha+\alpha'}{\sqrt{B\,B'}}.\dfrac{75.49\,p'}{397.37-at}}.$$

and for the true height—

$$H'-H=h'-h+\frac{h'^2}{r-h'}-\frac{h^2}{r-h}.$$

It remains to adapt these formula for tabular computation; and for the sake of brevity let us write

$$A=\frac{398.37}{397.37-at}.\,L\,(1+at),$$

$$\text{and } C'=\frac{75.49}{397.37-at}.\,p',$$

both which depend on t, the half sum of the temperatures at the two stations, so that we may write $t = \frac{1}{2}(\mathrm{t} + \mathrm{t}') - 32°$, t and t′ being the temperatures of the air at the lower and upper stations respectively in degrees Faht. The values of log A and log C′ are tabulated in the first table at the end of this with the argument $\frac{1}{2}(\mathrm{t} + \mathrm{t}')$

The whole factor dependant on the humidity of the air may be written—

$$C = \frac{1}{1 - C' . \dfrac{a + a'}{\sqrt{(BB')}}}$$

and its logarithm is given in Table II with the argument—

$$\text{Log } \frac{C' (a + a')}{\sqrt{B\,B'}}.$$

For the term giving the correction for latitude we may write—

$$G = \frac{1}{(g)} = \frac{1}{1 - 0.0026257 \cos. 2\,\lambda},$$

and tabulate log G for the different values of λ, as in Table III. Then:—

$$\text{Log } (h' - h) = \log (\log B - \log B') + \log A + \log C + \log G.$$

And lastly from Table IV a small correction due to the decrease of gravity above the sea-level is found, and the quantity $\dfrac{h'^2}{r - h'}$ there given, is to be added to $h' - h$, and the value of $\dfrac{h}{r - h}$ is to be subtracted, giving

$$H' - H = h' - h + \frac{h'^2}{r - h'} - \frac{h^2}{r - h},$$

for the true difference of altitude of the two stations in feet.

In using the tables, it must be observed that τ and τ' being the temperatures of the mercury at the two stations and b, b' the *observed* heights of the barometer,

$$\text{Log } B - \log B' = \log b - \log b' - 0.0000435\,(\tau - \tau')$$

when the expansion of the mercury alone has to be taken into account; but when the scale of the barometer is brass and extends from the cistern—

$$\text{Log B} - \log \text{B}' = \log b - \log b' - 0.00003905\ (\tau - \tau').$$

Example.

M M Bravais and Martins made the following observations:—On M. St. Bernard 8114 feet above the level of the sea $B = \overset{\text{mm.}}{568.03}$, $t = \overset{\circ}{7.6}$ Cent. or $\overset{\circ}{45.7}$ F. and $\alpha = 0.59$; and on M. Blanc $B' = \overset{\text{mm.}}{424.29}$, $t' = -\overset{\circ}{9.1}$ C. or $\overset{\circ}{15.3}$ F. and $\alpha' = 0.57$.

Here

$B = \overset{\text{in.}}{22.364}$..	log 1.34955	$\frac{1}{2}(t + t') = \overset{\circ}{30.6}$ F.	
$B' = 16.705$..	log 1.22284	$\alpha + \alpha' = 1.16$	
Diff. 0.12671..	log 9.102811	$\sqrt{B\,B'}$.. log	8.7138 — 10
Table I,......	Log A. 4.780555	Tab. I. log C′	8.5078
Table II, ...	Log C. 0.000842	$\alpha + \alpha'$.. log	0.0645
Table III,....	Log G.—0.000033	$C'.\dfrac{\alpha + \alpha'}{\sqrt{B\,B'}}$	= 7.2861
$h' - h$ ... 7659 ft. ..	log 3.884175		

Then by Table IV. 7659 + 12.9 — 3.2 + 8114 = 15782.7 feet the height.

II.—*Measurement of Heights by the Boiling Point of Water.*

1. It has long been known that the temperature of ebullition is lowered, as the pressure under which a fluid boils is decreased. This was first used by Archdeacon Wollaston, about 1817, as a means of measuring altitudes. Wollaston, however, in drawing up his table of heights corresponding to different temperatures of boiling water, made use of the empirical formula of Dr. Ure, for the elasticities of steam of different temperatures, and which was not calculated to give accurate results.

In the Journal of the Asiatic Society for 1833, the late Mr. James Prinsep discussed the subject, using Tredgold's formula for the tension of steam, but modifying the results to make them agree

as nearly as possible with the experiments of Ure, Southern and Dalton.* From these results, he calculated a table of heights corresponding to the boiling point for each degree of temperature from 176° to 214°. From observations made simultaneously with the barometer and boiling point thermometer, Colonel Sykes inferred that Prinsep's table gave altitudes generally less than those indicated by his barometer. Sykes made no observations at greater altitudes than 4500 feet, but at that height, the average error in Prinsep's table, seems to be over 100 feet.

This subject has since been discussed in a paper by Professor J. D. Forbes, published in the transactions of the Royal Society of Edinburgh for 1842-3, founded on observations made among the Alps. By projecting the elevations as derived from barometrical observations, but uncorrected for temperature, in terms of the observed boiling points, he found that a straight line passed almost quite through the whole of the projected points. Hence he inferred "*that the temperature of the boiling point varies in a simple arithmetical ratio with the height.*"

2. This hypothesis seems to require examination. The general form of the formula for heights as measured by barometrical observations is,—

$$h = \mathrm{L} \times \log \frac{\mathrm{B}}{\mathrm{B}'};$$

where B′ and B are the heights of the barometer at the upper and lower stations respectively, h the difference of elevation, and L the constant determined in the preceding section. But were Professor Forbes's hypothesis true, we should have—

$$\mathrm{T} - \mathrm{T}' = n \log \frac{\mathrm{B}}{\mathrm{B}'}, \ldots\ldots\ldots\ldots\ldots \quad (1)$$

T and T′ being the boiling temperatures at the two stations or under the pressures B and B′ respectively. And combining these formula, we obtain—

$$h = \frac{\mathrm{L}}{n}(\mathrm{T} - \mathrm{T}') \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

as the expression for the approximate height.

* Jour. Asiat. Soc. of Bengal, April 1833, pp. 194 200.

Now, in order to determine whether the hypothesis is correct or not, it is only necessary to discover whether or not the quantity n, as derived from observations made at different altitudes is constant. In the following table I have collected a few observations made by Professor Forbes,* Dr. Hooker,† M. Marié,‡ and others, tabulating in column (5) the value of n derived from each, and in column (6) the boiling point corresponding to the observed pressures given in column (3) calculated on the supposition that $n = 112$. Column (7) shews the differences between these and the observed values.

(1) Station	(2) Observer	(3) Barometer in inches and at 32° F.	(4) Observed boiling point corrected	(5) Calculated value of n.	(6) Calculated boiling point from $n = 112$.	(7) Diff.
Gt. Rungeet River.	Dr. Hooker.	29.211	210.°8	103.91	210°.70	—0°.10
Martigny.	Dr. Forbes.	28.489	209.5	117.29	209.61	+ 0.11
Mont Pila.	M. Marié.	28.207	209.05	115.19	209.13	+ 0.08
do. „	do.	26.258	205.48	114.88	205.65	+ 0.17
do. „	do.	25.819	204.71	113.82	204.83	+ 0.12
Churra, Khasia Mts.	Dr. Hooker.	25.596	204.3	111.68	204.28	— 0.02
Mont Pila.	M. Marié.	25.433	203.88	115.01	204.09	+ 0.21
Gressonay.	Dr. Forbes.	25.143	203.58	111.4	203.54	— 0.04
Choongtam.	Dr. Hooker.	24.697	202.5	112.46	202.54	+ 0.04
Myrung, Khasia.	do.	24.453	201.9	113.75	202.06	+ 0.16
Prarayon.	Dr. Forbes.	23.893	200.96	113.0	201.06	+ 0.10
Darjiling.	Dr. Hooker.	23.358	199.6	114.09	199.83	+ 0.23
Tacul.	Dr. Forbes.	23.353	199.98	111.7	199.94	— 0.04
do.	do.	23.154	199.48	112.43	199.53	+ 0.05
St. Bernard.	do.	22.674	198.46	112.4	198.51	+ 0.05
Zemu Samdong.	Dr. Hooker.	21.605	195.9	112.93	196.03	+ 0.13
Col Collon.	Dr. Forbes.	20.77	194.53	110.16	194.24	— 0.29
Mainom, Sikkim.	Dr. Hooker.	20.48	193.4	112.19	193.43	+ 0.03
Yeumtong, do.	do.	19.49	191.1	111.58	191.02	— 0.08
Tungu, do.	do.	18.869	189.5	111.73	189.45	— 0.05
Mont Blanc.	Saussure.	17.133	187.23§	109.97	186.89	— 0.34
Pichincha.	M. Wisse.	17.208	185.27	111.26	185.09	— 0.18
Yeumtso, Sikkim.	Dr. Hooker.	16.385	183.2	109.64	182.58	— 0.62
Sebolah Pass, do.	do.	16.928	181.9	109.48	181.21	— 0.69

* Edin. Phil. Trans. vol. xv.

† Given in a second paper by Prof. Forbes, Edin. Phil. Trans. vol. xxi. part 2.

‡ Quoted by Regnault, Ann. de Chim. et de Phys. July 1844.

§ Saussure's boiling-point, 80° R., corresponded to a pressure of 27 French inches.

The numbers in columns (5) and (7) of this table at once shew that whilst the hypothesis of Professor Forbes is not rigorously true, n decreasing with the temperature, it is still a very good proximation when the heights are under 10,000 feet, or the boiling-point above 193° Faht.; and as 112 is about the mean value of n, we have by substitution in equation (2), and using 60369 feet as the value of L,—

$$h = 539.01\ (T - T'), \quad\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

as the expression for the height uncorrected for the temperature of the air. Professor Forbes, in the paper above referred to, gives 549.5 as the value of the co-efficient, and in a later paper on the same subject he proposes 543.2 feet as best representing observations when the boiling-point is above 190° Faht. or when the heights are under 12,000 feet; but when the boiling-point is above 192° F., he states in a note that the co-efficient should be only 535 feet, in order to express the heights as derived from Regnault's table of tensions.

3. After making due allowance for errors of observation, it is evident that the values of n in column (5) of the preceding table, decrease with the temperature. Hence, in order to derive a formula which shall *accurately* represent heights in terms of the boiling-point of water, it is only necessary to determine the value of n at the standard boiling-point, and the mean rate of its variation for temperatures near that point. For this purpose Regnault's tension series, from the method by which he obtained his experimental values, may be taken as representing the pressures under which water boils at different temperatures.* For temperatures near 100° Cent. however, Moritz has shewn that the values in Regnault's table are slightly in error on account of the constants not having been calculated with sufficient accuracy. Moritz has corrected and published the values of the tensions where they differ from Regnault's.† In what follows, I have used these corrected values.

Now, from equation (1) we at once derive,—

* Ann. de Chim. et de Phys. July 1844. Forbes, Edin. Phil. Trans. vol. xxi part II. p. 238.

† Bullet. de la classe Physico-math. de l' Acad. de St. Petersbourg, xiii. 41.

$$n = \frac{T - T'}{\log B - \log B'} \dots\dots\dots\dots\dots \quad (4)$$

and hence when $B = B'$, and $T = 100°$ cent. using Moritz's values, we have

$$n = \frac{d\,T}{d.\log B} = \frac{B.\,d\,T}{M.\,d\,B} = 64.307626 \;.. \quad (5)$$

and when $T' = 80°$ C., we have, by equation (4)—

$$n_{80} = \frac{20}{\log B_{100} - \log B'_{80}} = 60.412836$$

and as the value of n is found to vary pretty regularly with the temperature between these two points, we may write—

$$n_T = 64.30763 - \frac{n_{100} - n_{80}}{20}(100 - T)$$

$$= 64.30763 - 0.1947445\,(100 - T) \dots\dots \quad (6)$$

Substituting this value in equation (4) we find—

$$\text{Log}\,B_{100} - \log B_T = \frac{100° - T}{64.3076 - 0.19474\,(100 - T)}$$

$$= \frac{5.13493\,(100 - T)}{330.215 - (100 - T)} \dots\dots\dots \quad (7)$$

We obtain a result almost identical with this by applying the method of least squares to the logarithms of Moritz's tensions at 80°, 85°, 90° and 95°, viz.—

$$\text{Log}\,B_{100} - \log B_T = \frac{5.108555\,(100 - T)}{328.62566 - (100 - T)} \;.. \quad (8)$$

either of the equations (7) and (8) will give the logarithms of the pressures in millimetres of mercury for temperatures between 80° and 100° C. generally correct to the 5th or 6th decimal place, by using the following values.

For $\log B_{100} = \log 760^{\text{mm.}}$ 2.8808136
For log 5.108555 .... 0.7082981

If now we combine equations (2) and (8) and introduce the value of L for a standard atmosphere at 0° Cent, the approximate height is

$$\left.\begin{array}{l} h_m = 94082 \times \dfrac{100 - T}{228.626 + T}, \\ \text{and } \log h_m = 4.973506 + \log(100 - T) - \log(228.626 + T), \end{array}\right\} (9)$$

when expressed in metres above the point where water boils at 100° cent.

4. Now if the boiling-point on Fahrenheit's scale coincided exactly with that on the centigrade, that is if 212° F. represented the temperature of boiling water under a pressure of 29.9218 inches of mercury,* this formula, and the logarithms of the pressures in the table of Moritz might at once be modified to suit the English scales. But if the thermometer be so constructed that the boiling-point is at 212° F. under 30 inches of pressure, the centigrade ought, in the same circumstances, to shew 100°.0729; and as the freezing point may be considered invariable, 176° F. will coincide with 80°.0583 C. To make the necessary correction for this difference, which is often overlooked, I have, after interpolation among Moritz's pressures, derived the following formula of essentially the same form as that first used by Biot,† and which accurately represents the results derived from Moritz's table,—

$$\left.\begin{array}{l} \text{Log } B_T = \log 30 - 0.008641566\,(212° - T) \\ -0.0000143365\,(212° - T)^2 - 0.00000003161\,(212° - T)^3. \end{array}\right\} (10)$$

This formula, which is adapted to Fahrenheit's scale, will give the same results as the more complicated one of Regnault when T lies between 172° and 216° Faht. The values of the logarithms of the pressures in the table of Moritz may, in like manner, be represented between 78° and 102° C. by the formula,—

* "J' adopterai les températures, au thermomètre à mercure, divisé en cent degrés, depuis la température de la glace fondante, jusqu'à celle de l'eau bouillante sous une pression équivalente au poids d'une colonne de mercure, de soixante et seize centimètres de hauteur." *Laplace, Exposition du Système du Monde —avertissement.*

† Biot, Traité de Physique (1816) tom. I. p. 278; also Ency. Metropol. (1845) vol. iv. p. 249.

$$\left.\begin{aligned}\text{Log } B_T = \log \overset{\text{mm.}}{760} - 0.01555026\,(100^\circ - T)\\ - 0.0000464227\,(100^\circ - T)^2 - 0.00000018515\,(100^\circ - T)^3\end{aligned}\right\}$$

By means of equation (10), Table V. has been constructed, giving the logarithms of the pressures in inches of mercury for every fifth part of a degree from 176° to 215° F.; and from the same equation we derive for Fahrenheit's scale—

$$n = \frac{B.\,d\,T}{M.\,d\,B} = 115.71976,$$

and from the table, by least squares,—

$$\text{Log } \overset{\text{in.}}{30} - \log B_T = \frac{212^\circ - T}{115.71976 - 0.1957\,(212 - T)}$$

$$= \frac{5.108273\,(212 - T)}{379.319 + T} \,\ldots\ldots\ldots \quad (11)$$

where $\log 5.108273 = 0.7082741$.

And, as before, the elevation in feet above the point where water boils at 212° Faht. will be found by multiplying the right hand side of this equation by $L = 60369$ feet, viz.:

$$\left.\begin{aligned} h &= \frac{308382\,(212 - T)}{379.319 + T},\\ \text{or } \log h &= 5.488089 + \log(212 - T) - \log(379.319 + T).\end{aligned}\right\}(12)$$

5. If the boiling-point be observed at two stations, whose difference of level is required,—writing $D = 212^\circ - T$, and D' for $212^\circ - T'$, we have,—

$$\left.\begin{aligned} h' - h &= \frac{308382\,(T - T')}{167.319 + (T + T') + 0.00169\,DD'},\\ &\text{or, since } 0.00169 \text{ is very nearly } \frac{1}{600}, \text{ we may use } \frac{DD}{600'},\\ \therefore \text{Log}\,(h' - h) &= 5.488089 + \log\,(T - T')\\ &\quad - \log\left(167.319 + T + T' + \frac{DD'}{600}\right)\end{aligned}\right\}(13)$$

6. The same value of h as found from equation (12) may also be derived, in a different form, from equation (10), by multiplying log 30 — log B by L, thus:—

$$h = 521.684\ (212 - \mathrm{T}) + 0.8655\ (212 - \mathrm{T})^2 + 0.0019\ (212 - \mathrm{T})^3 \ldots\ldots\ldots\ldots \quad (14)$$

or, as a good approximation in two terms,—

$$h = 520.476\ (212 - \mathrm{T}) + 0.967\ (212 - \mathrm{T})^2 \ldots \quad (15)$$

7. For the height in *metres* in terms of T on the Centigrade scale, we may, instead of equation (9), use,—

$$\left.\begin{array}{l} h_{\mathrm{m}} = 286.2\,(100 - \mathrm{T}) + .8546\,(100 - \mathrm{T})^2 + 0.00341\ (100 - \mathrm{T})^3, \\ \text{or approximately, } h_{\mathrm{m}} = 285.54\ (100 - \mathrm{T}) + 0.955\ (100 - \mathrm{T})^2. \end{array}\right\} (16)^*$$

8. The equations now deduced for expressing the height in terms of the boiling-point of water require to be corrected in the same manner for the temperature of the air, &c. as those derived from barometrical observations. Hence substituting equation (11) in the formula already given for the barometer, and omitting the terms depending upon the hygrometrical state of the atmosphere, and the diminution of gravity with the height, we have for the correct height—

$$\mathrm{H}' - \mathrm{H} = \frac{5.10827\ (\mathrm{T} - \mathrm{T}')}{167.319 + \mathrm{T} + \mathrm{T}' + \frac{1}{600}\,\mathrm{D}\ \mathrm{D}'}$$

$$\times\ \mathrm{L}.\ \frac{398.37\ (1 + at)}{397.37 - at} \times \frac{1}{(g)} \ \ldots\ldots\ldots\ldots \quad (17)$$

or, adopting the notation already employed—

* Professor Forbes has arrived at almost exactly the same results. For equation (15), he gives—

$$517\ (212^\circ - \mathrm{T}) + (212^\circ - \mathrm{T})^2;$$

and for equation (16)—

$$h_{\mathrm{m}} = 284\ (100 - \mathrm{T}) + (100 - \mathrm{T})^2;$$

the equation—

$$h = 519.66\ (212^\circ - \mathrm{T}) + (212^\circ - \mathrm{T})^2$$

will give almost exactly the same results as equation (15).

$$\left.\begin{array}{l}\text{Log}\,(H' - H) = 0.708274 + \log\,(T - T') \\ -\log\,(167.319 + T + T' + \dfrac{DD'}{600}) + \log A + \log G.\end{array}\right\} \quad (18)$$

9. To facilitate computations of this kind, Tables V and VI have been formed. Table VI gives the height in feet above the level where water boils at 212° Faht. for every fifth part of a degree between 176° and 215° F. This Table and the column containing the *Multiplier* for the mean temperature of the air in Table I will enable us to obtain the heights, uncorrected for latitude, without the use of logarithms. Table V containing the logarithmic pressures will be of use when one of the observations is taken with a barometer.

10. When the observations are taken at the upper station only, it becomes necessary to estimate t, the mean temperature of the stratum of air between the sea level and that station approximately. Laplace estimated the diminution of temperature with the elevation at 16° or 17° cent. for 3000 metres of ascent,* but taking the mean of observations made on mountain sides by Saussure, Kaemtz, Bravais, Martins, Schouw, Humboldt, Boussingault, and the recent French Commission to the North, the diminution is 1° Faht. for every 303 feet of ascent.† Hence we may reckon that for every degree which the boiling-point falls, the temperature of the air decreases 1°.8 F., so that the mean temperature may be estimated at,—

$$\tfrac{1}{2}\,(t + t') = t' + 0.9\,(212^\circ - T'),$$

or when the observation is made with the barometer,

$$\tfrac{1}{2}\,(t + t') = 91\tfrac{1}{2} + t' - \frac{190\,B'}{30 + B'},$$

or, roughly—

$$\tfrac{1}{2}\,(t + t') = 60 + t' - \frac{9}{4}\,B'.$$

* Laplace, Systeme du Monde, tom. i. p. 172 (Ed. 1836.)

† On this subject, see a paper by Professor Challis, in the Transactions of the Cambridge Philosophical Society, vol. vi.; and Daniell's Meteorology, vol. i. pp. 40, 41.

11. With respect to the method of making observations with the boiling-point thermometer, it is only necessary to observe that the instrument described by Professor Forbes in the paper already referred to* seems the most convenient and trustworthy of any that has been proposed, and very superior to that described by Colonel Sykes,† and still more so to that manufactured by Casella and sold in India along with Prinsep's Table—an instrument which never could be expected to give accurate results. Professor Forbes's boiling apparatus consisted of a thin copper pan heated by a "Russian Furnace," having a powerful jet of inflamed alcoholic vapour, which might be removed to one side until the escape of steam became uniform and moderate, and could be used in a gale of wind. The thermometer had its bulb immersed in the water, of which a moderately large quantity is requisite to a good result.

The following examples will shew the use of the tables and formulæ.

Example I. The following data are given in "Smith and Thuillier's Manual of Surveying" (p. 436)—Boiling-point at the lower station 208°.7 and temperature of the air 83°; at the upper station B. P. 204°.2, and air 75° Faht., to find the difference of elevation,

By the formula (18)—

$D = 212 - 208.7 = 3.3.$ $D' = 212 - 204.2 = 7.8.$ And $DD' = 25.7.$ $T + T' = 412.9.$ $T - T' = 4.5.$ And $\frac{1}{2}(t + t') = 79°.$

Now $167.32 + 412.9 = 580.22$

$+ \dfrac{25.7}{600} = 0.04$

580.26.	ar. co. log	7.23638 — 10.
$T - T' = 4.5$	log	0.65321.
$\frac{1}{2}(t + t') = 79°$	log A	4.82175.
	Const. log	0.70827.
Height 2628 feet	log	3.41961.

* Edin. Trans. vol. xv.

† See Journal of the Royal Geographical Society, vol. viii. p. 436.

Otherwise, by Table VI.

Height corresponding to	204°.2	4123 feet
" " "	208.7	1731 "
Difference, or Approximate height, ...		2392 "
79° Multiplier from Table I, ...		1.099
Corrected height, as before, ...		2628 feet.

Col. Sykes by barometrical observations finds the height 2649 feet, the difference being within the limits of error of observation.

Example II. The following data are partly taken from Prof. Forbes's paper.—Saussure's boiling-point, 80° R. was adjusted at 27 French inches, or 28.777 English. At that pressure the standard thermometer shewed 209°.96. De Saussure's stood therefore 2°.04 F. higher. Now on the top of Mont Blanc, the boiling-point was 187°.23 F. or reduced to the standard thermometer 185°.19 F. and at Geneva, 1345 feet above the sea-level, the barometer indicated 27.267 French, or 29.063 English inches, the mean temperature of the air being about 55° F.

Here, 29.063 in. .... log 1.463304
T′ = 185°.19 (Table V.) " 1.234523

Diff. of logs 0.228781 .. log 9.35942.
$\frac{1}{2}(t + t') = 55°$ ..... log A 4.80186.

Height above Geneva 14497 ft. .... log 4.16128.
Geneva above the sea 1345

Height of M. Blanc 15842 feet,

being almost exactly the height found barometrically by Saussure, and only 55 feet more than MM. Bravais and Martins's determination, and 59 feet higher than Corabeuf's trigonometrical measurement. The same result may also be found otherwise, thus:—

By Table VI. height corresponding to 185°.19	....	14645 feet.
By Barometrical Tables the diff. of heights corresponding to $30^{in.}$ and $29^{in.}.063$	....	834
Difference, or approximate height,	....	13811
$\frac{1}{2}(t + t') = 55°$, Multiplier from Table I.	....	1.0497
Corrected height, as before, above Geneva,	....	14497 ft.

Example III. (Boileau's Tables, Int. p. xix.) At the Parang Pass in lat. 32°$\frac{1}{4}$ N. the observed temperature of the boiling-point was 179°.3, the temperature of the air being 27° F. to find the altitude of the pass above the level of the sea.

Here, by the formula, $\frac{1}{2}(t + t') = 27° + 0.9\,(212 - 179.3) = 56°$.

Approximate height by Table VI.	18052 feet
$\frac{1}{2}(t + t') = 56°$ .. Multiplier by Table I.	1.0517
Corrected height above sea-level, ...	18985 feet

differing from Boileau's result principally from the higher value assigned to t, and partly from the standard pressure in Boileau's table being $29^{in.}.921$ instead of $30^{in.}$, which gives a difference of about 60 feet in the elevation.

12. A small correction ought to be applied on account of the variation of the pressure at the level of the sea in different latitudes from a standard of 30 inches. Tables V ahd VI are calculated on the hypothesis that the pressure of the atmosphere at the level of the sea is 30 inches. Observations prove that the mean pressure varies in different latitudes, and according to the experimental and theoretical observations of Munke and others, the following short table has been constructed shewing, in column (2), the height of the barometer in different latitudes equal to a height of 30 inches in lat. 45°, in columns (3) and (5) the mean heights of the barometer as derived, with some modifications, from Munke and Dr. Golding Bird* respectively, and in columns (4) and (6) the

* Dr. Golding Bird's Natural Philosophy, p. 208.

corresponding* corrections in feet, to be added to, or subtracted from, the altitudes derived from observations at the upper station only, by means of the tables and formulæ.

(1) Lat.	(2) Height of barometer, equal to 30in. in lat. 45°.	(3) Mean height of the barometer from Munke	(4) Correction according to Munke.	(5) Mean height of barometer from Dr. G. Bird.	(6) Correction according to Dr. G. Bird.
		in.	feet.	in.	feet.
0	30.079	29.930	— 129.8	29.930	— 129.8
10	30.074	29.935	— 121.3	29 975	— 86.5
20	30.060	29.950	— 96.8	30.064	+ 3.2
30	30.039	29.972	— 59.2	30.108	+ 59.8
40	30.014	29.999	— 13 2	30.019	+ 4.4
45	30.000	30.013	+ 11.4	30.000	0.0
50	29.986	30.027	+ 35.9	29.968	— 15.7
55	29.973	30.041	+ 60.2	29.919	— 47.4
60	29.961	30.054	+ 81.9	29.803	— 138.3
65	29.949	30.066	+ 101.8	29.609	— 299.8
70	29 940	30.076	+ 119.5	29.740	— 175.4
80	29.926	30.091	+ 143.9		

* These corrections are in some cases very different, but those in column (6) are probably in general the most trustworthy,-as best agreeing with the observations of Schouw, Sir J. Herschel, Sir James Ross, &c. See Daniell's Meteorology, (Ed. 1845) vol. I. pp. 132, 133.

TABLE I.

Argument: $\frac{t + t'}{2}$ Faht.

$\frac{t+t'}{2}$	Multiplier.	Log. A.	Diff. for 0.1	Log. C'.
10°	0.95744	4.761926	92,9	8.1188
11	95949	762855	92,6	1378
12	96154	763781	92,4	1572
13	96359	764706	92,2	1763
14	96564	765628	92,0	1956
15	96768	766549	91,8	2152
16	96973	767467	91,7	2344
17	97178	768384	91,5	2532
18	97383	769299	91,3	2725
19	97588	770212	91,1	2915
20	0.97793	4.771122	90,9	8.3105
21	97998	772031	90,7	3298
22	98203	772938	90,5	3487
23	98407	773843	90,3	3679
24	98612	774746	90,2	3866
25	98817	775648	90,0	4058
26	99022	776548	89,8	4235
27	99227	777445	89,6	4436
28	99432	778341	89,4	4625
29	99637	779235	89,2	4815
30	0.99842	4.780127	89,0	8.5001
31	1.00046	781018	88,9	5190
32	00252	781907	88,7	5378
33	00456	782793	88,5	5552
34	00662	783678	88,3	5723
35	00866	784562	88,1	5894
36	01071	785443	88,0	6065
37	01276	786323	87,8	6233
38	01481	787200	87,6	6403
39	01686	788077	87,4	6569
40	1.01891	4.788951	87,3	8.6737
41	02096	789824	87,1	6903
42	02301	790695	86,9	7079
43	02506	791564	86,7	7235
44	02711	792431	86,6	7399
45	02916	793297	86,4	7563
46	03121	794161	86,2	7726
47	03326	795023	86,1	7889
48	03531	795883	86,9	8051
49	03736	796742	85,7	8212

Table I. continued.

$\frac{\iota + \iota'}{2}$	Multiplier.	Log. A.	Diff. for 0°.1	Log C′.
50°	1.03940	4.797599	85,6	8.8373
51	04145	798455	85,4	8534
52	04350	799309	85,2	8693
53	04555	800161	85,0	8851
54	04760	801011	84,9	9009
55	04965	801860	84,7	9166
56	05170	802707	84,6	9324
57	05375	803553	84,4	9479
58	05580	804397	84,2	9635
59	05785	805239	84,1	9789
60	1.05990	4.806080	83,9	8.9943
61	06195	806919	83,8	9.0097
62	06400	807757	83,6	0250
63	06605	808593	83,4	0402
64	06810	809427	83,3	0555
65	07015	810259	83,1	0705
66	07220	811090	83,0	0856
67	07425	811920	82,8	1006
68	07630	812748	82,6	1155
69	07835	813574	82,5	1304
70	1.08040	4.814399	82,3	9.1452
71	08245	815222	82,2	1599
72	08450	816044	82,0	1747
73	08655	816864	81,9	1893
74	08860	817683	81,7	2038
75	09065	818500	81,6	2184
76	09270	819315	81,4	2328
77	09475	820129	81,3	2472
78	09680	820942	81,1	2615
79	09885	821753	81,0	2758
80	1.10090	4.822563	80,8	9.2900
81	10295	823371	80,7	3042
82	10500	824177	80,5	3183
83	10705	824982	80,4	3324
84	10910	825786	80,2	3464
85	11115	826588	80,1	3603
86	11320	827388	79,9	3742
87	11525	828187	79,8	3880
88	11730	828985	79,6	4018
89	11935	829781	79,5	4155

Table I. continued.

$\frac{t + t'}{2}$	Multiplier.	Log. A.	Diff. for 0°.1	Log. C'.
90°	1.12140	4.830576	79,3	9.4292
91	12345	831369	79,2	4428
92	12550	832161	79,0	4563
93	12755	832952	78,9	4698
94	12960	833741	78,8	4833
95	13165	834528	78,6	4968
96	13370	835314	78,5	5090
97	13575	836099	78,3	5233
98	13781	836883	78,2	5365
99	13986	837665	78,1	5497
100	1.14191	4.838446	77,9	9.5628
101	14396	839224	77,8	5760
102	14601	840002	77,6	5889
103	14806	840779	77,5	6019
104	15011	841554	77,4	6149
105	15216	842327	77,2	6278
106	15421	843100	77,1	6406
107	15626	843871	77,0	6532
108	15831	844640	76,8	6661
109	16036	845408	76,7	6787
110	1.16241	4.846175	76,5	9.6913
111	16446	846941	76,4	7039
112	16651	847705	76,3	7165
113	16856	848468	76,1	7288
114	17062	849229	76,0	7413
115	17267	849989	75,9	7537
116	17472	850748	75,8	7660
117	17677	851506	75,6	7783
118	17882	852262	75,5	7905
119	18087	853017	75,4	8026

TABLE II.

Argument—Log. C′. $\frac{a + a'}{\sqrt{B\,B'}}$

Arg.	Log. C	Arg.	Log. C	Arg.	Log. C
6.0	0.000043	7.62	0.001814	8.02	0.004572
6.1	.000055	7.63	.001856	8.03	.004679
6.2	.000069	7.64	.001900	8.04	.004788
6.3	.000087	7.65	.001944	8.05	.004900
6.4	.000109	7.66	.001990	8.06	.005015
6.5	.000137	7 67	.002036	8.07	.005133
6.6	.000173	7.68	.002084	8.08	.005253
6.7	.000218	7.69	.002132	8.09	.005376
6.8	.000274	7.70	.002182	8.10	.005502
6.9	.000345	7.71	.002233	8.11	.005631
7.0	0.000435	7.72	0.002286	8.12	0.005763
7.05	.000488	7.73	.002339	8.13	.005898
7.10	.000547	7.74	.002393	8.14	.006037
7.15	.000614	7.75	.002449	8.15	.006178
7.20	.000689	7.76	.002506	8.16	.006323
7.25	.000773	7.77	.002565	8.17	.006472
7.30	.000868	7.78	.002625	8.18	.006624
7.35	.000973	7.79	.002686	8.19	.006779
7.40	.001092	7.80	.002749	8.20	.006938
7.41	.001118	7.81	.002813	8.21	.007101
7.42	0.001144	7.82	0.002880	8.22	0.007268
7.43	.001171	7.83	.002946	8.23	.007439
7.44	.001198	7 84	.003015	8.24	.007569
7.45	.001226	7.85	.003086	8.25	.007793
7.46	.001253	7.86	.003158	8.26	.007976
7.47	.001284	7.87	.003232	8.27	.008163
7.48	.001314	7.88	.003308	8.28	.008355
7.49	.001344	7.89	.003384	8.29	.008552
7.50	.001376	7.90	.003464	8.30	.008753
7.51	.001408	7.91	.003545	8.31	.008959
7.52	0.001441	7.92	0.003627	8.32	0.009170
7.53	.001474	7.93	.003712	8.33	.009386
7.54	.001509	7.94	.003799	8.34	.009607
7 55	.001543	7.95	.003888	8.35	.009833
7.56	.001580	7.96	.003979	8 36	.010065
7.57	.001617	7.97	.004072	8.37	.010302
7.58	.001654	7.98	.004167	8.38	.010545
7.59	.001693	7.99	.004265	8.39	.010794
7.60	.001732	8.00	.004365	8.40	.011048
7.61	.001773	8.01	.004467		

TABLE III.

ARGUMENT:—LATITUDE, λ..

Lat. λ	Log. G. +		Lat. λ	Log. G. +	
0°	0.001142	90	23°	0.000795	67
1	001141	89	24	000764	66
2	001139	88	25	000734	65
3	001136	87	26	000704	64
4	001131	86	27	000671	63
5	001125	85	28	000638	62
6	001117	84	29	000605	61
7	001108	83	30	000571	60
8	0.001100	82	31	0.000536	59
9	001086	81	32	000500	58
10	001073	80	33	000464	57
11	001059	79	34	000427	56
12	001043	78	35	000390	55
13	001026	77	36	000353	54
14	001008	76	37	000315	53
15	000988	75	38	000276	52
16	0.000968	74	39	0.000237	51
17	000946	73	40	000198	50
18	000924	72	41	000159	49
19	000899	71	42	000117	48
20	000875	70	43	000080	47
21	000848	69	44	000040	46
22	000821	68°	45	000000	45°
	— Log. G.	λ Lat.		— Log. G.	λ Lat.

TABLE IV.

ARGUMENT:—

HEIGHTS, *h*, *h′*.

h' / h	+ / —	h' / h	+ / —
Ft.	Ft.	Ft.	Ft.
500	0.0	11500	6.3
1000	0.0	12000	6.9
1500	0 1	12500	7.5
2000	0.2	13000	8.1
2500	0.3	13500	8.7
3000	0.4	14000	9 4
3500	0.6	14500	10.1
4000	0.8	15000	10.8
4500	1.0	15500	11.5
5000	1.2	16000	12.3
5500	1.4	16500	13.0
6000	1.7	17000	13.8
6500	2.0	17500	14.7
7000	2.3	18000	15.5
7500	2.7	18500	16.4
8000	3.1	19000	17.3
8500	3.5	19500	18.2
9000	3.9	20000	19.2
9500	4.3	20500	20.1
10000	4.8	21000	21.1
10500	5.3	21500	22.2
11000	5.8	22000	23.2

TABLE V.

Logarithms of the Barometrical Pressures in inches of Mercury corresponding to Boiling points between 176° and 215° Faht.

T.	·0	·2	·4	·6	·8	Diff. for 0°.1.
°						
176	1.145960	1.147929	1.149877	1.151833	1.153787	978
177	155740	157692	159642	161591	163539	974
178	165485	167429	169373	171314	173255	971
179	175194	177131	179068	181003	182936	967
180	184868	186799	188728	190656	192582	964
181	194508	196431	198354	200275	202194	960
182	204112	206029	207945	209859	211772	957
183	213683	215593	217502	219409	221315	953
184	223219	225122	227024	228925	230824	950
185	232721	234618	236513	238407	240299	947
186	1.242190	1.244080	1.245968	1.247855	1.249740	943
187	251625	253508	255389	257270	259148	940
188	261026	262902	264777	266651	268523	937
189	270394	272264	274132	275999	277865	933
190	279729	281592	283454	285314	287174	930
191	289031	290888	292743	294597	296450	927
192	298301	300151	302000	303847	305693	923
193	307538	309381	311224	313064	314904	920
194	316742	318580	320415	322250	324083	917
195	325915	327746	329575	331403	333230	914
196	1.335056	1.336880	1.338703	1.340525	1.342345	911
197	344165	345983	347799	349615	351429	908
198	353242	355054	356864	358673	360481	905
199	362288	364094	365898	367701	369503	901
200	371303	373102	374900	376697	378493	898
201	380287	382080	383872	385663	387452	895
202	389240	391027	392813	394597	396381	892
203	398163	399944	401723	403502	405279	889
204	407055	408830	410603	412376	414147	886
205	415917	417686	419453	421220	422985	883
206	1.424749	1.426512	1.428273	1.430034	1.431793	880
207	433551	435308	437064	438818	440571	877
208	442324	444075	445824	447573	449320	874
209	451067	452812	454556	456298	458040	871
210	459781	461520	463258	464995	466731	868
211	468465	470199	471931	473662	475392	866
212	477121	478849	480576	482301	484025	863
213	485749	487471	489191	490911	492630	860
214	494347	496064	497779	499493	501206	857

TABLE VI.

Heights corresponding to different boiling points from 176° to 215° Faht. in feet.

T.	·0	·2	·4	·6	·8	Diff for 0°1.
°	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.
176	19992	19874	19756	19637	19519	59.0
177	19401	19284	19166	19048	18931	58.9
178	18813	18696	18579	18461	18344	58.6
179	18227	18110	17993	17876	17760	58.4
180	17643	17527	17410	17294	17177	58.2
181	17061	16945	16829	16713	16597	58.0
182	16481	16366	16250	16134	16019	57.8
183	15904	15788	15673	15558	15443	57.6
184	15328	15213	15098	14983	14869	57.4
185	14754	14640	14525	14411	14297	57.2
186	14183	14069	13955	13841	13727	57.0
187	13613	13499	13386	13272	13159	56.8
188	13045	12932	12819	12706	12593	56.6
189	12480	12367	12254	12142	12029	56.4
190	11916	11804	11692	11579	11467	56.2
191	11355	11243	11131	11019	10907	56.0
192	10795	10684	10572	10460	10349	55.8
193	10238	10126	10015	9904	9793	55.6
194	9682	9571	9460	9349	9239	55.4
195	9128	9018	8907	8797	8687	55.2
196	8576	8466	8356	8246	8136	55.0
197	8026	7917	7807	7697	7588	54.8
198	7478	7369	7260	7151	7041	54.6
199	6932	6823	6714	6606	6497	54.4
200	6388	6280	6171	6063	5954	54.2
201	5846	5738	5629	5521	5413	54.0
202	5305	5197	5090	4982	4874	53.8
203	4767	4659	4552	4444	4337	53.7
204	4230	4123	4016	3909	3802	53.5
205	3695	3588	3481	3375	3268	53.3
206	3162	3055	2949	2843	2736	53.1
207	2630	2524	2418	2312	2206	52.9
208	2101	1995	1889	1784	1678	52.8
209	1573	1468	1362	1257	1152	52.6
210	1047	942	837	732	627	52.4
211	523	418	313	209	104	52.3
212	0	— 104	— 208	— 313	— 417	52.1
213	— 521	— 625	— 729	— 832	— 936	51.9
214	— 1040	— 1144	— 1247	— 1351	— 1454	51.7

Postscript.

It may be here remarked,—1. That the formulæ (10) and (11) give very approximate results only when the pressure is above half an atmosphere, but taking Regnault's value of the tension of vapour at 32° Faht., we have

$$\log p' = 1.25793 + \frac{7.426375\ (T - 32)}{422.5743 + (T - 32)},$$

which gives a maximum error of 0.025 in. at 122° Faht.

2. That the quantity a, or the fraction of saturation may be easily determined with very considerable accuracy from the formula—

$$\log a = 1 - 0.0170571\ (t - \tau) + 0.0000289866\ (t^2 - \tau^2),$$

where t is the temperature of the air reckoned in degrees Fahrenheit from freezing-point, and τ the dew point reckoned in the same manner.

3. That to the constants L and a in the general formula for the determination of heights by the barometer, and to which I have assigned the values 60369.15 feet, and 0.002039, respectively, different investigators have assigned various other values. The principal of these are as follows :—

	L, in. feet.	a, for 1° F.
Deluc, ...	58958.2	0.002242.
Schuckburgh, ...	60109.2	0.002425.
General Roy, ...	60032.4	0.002454.
Trembley, ...	60115.6	0.002462.
Ramond, and Littröw, ...	60345.6	0.002222.
Lindenau, ...	60377.7	0.002222.*
Poisson, ...	60161.8	0.002222.
Baily, ...	60158.5	0.002083.
Bessel, ...	60094.7	{ 0.002222, or 0.002027.

* Lindenau followed Euler and Oriani in supposing the temperature of the air to diminish in harmonical progression through a series of heights increasing in arithmetical proportion. His form of the term depending upon the temperature was—

$$1 + \frac{t + t' - 64}{900} - \frac{(t - t')^2}{810{,}000},$$

t and t′ being in degrees Fahrenheit. Lindenau's Tables (Gotha 1809) were in some respects the best published in the early part of this century.

Calcutta, 19*th August*, 1858.

PROCEEDINGS

OF THE

ASIATIC SOCIETY OF BENGAL,

For September, 1858.

The Monthly General Meeting for September was held on the 1st instant.

Lieut.-Col. R. Strachey, Vice-President, in the chair.

The proceedings of the August Meeting were read and confirmed.

Presentations were received—

1. From the Rajah Radha Kant Deb, Bahadoor, an Appendix to his Sanscrit Encyclopædic Lexicon called the Sabda-Kulpa-Druma.

2. From Major H. L. Thuillier through Mr. Smith, a Hindu Sculpture being the image of Vishnu.

3. From Herr. H. Schlagintweit through Dr. Eatwell an explanatory table of the Relief des Monte-Rosa und Seiner Umgebungen.

Lieut.-Col. Strachey on behalf of Dr. Mouat presented to the Society a Photographic likeness of an Andaman Islander* and some Photographic pictures of the Volcano of Barren Island and of the vicinity of Port Blair.

Communications received.—

1. From E. Thomas, Esq., B. C. S., a Catalogue of the collection of coins and gems belonging to the late Col. Stacy for the purchase of which the Society is in treaty.

2. From Dr. C. A. Gordon of H. M. 10th Foot through the late Mr. Piddington an analysis of the Meteorological Observations taken on board the ship *Palmyra* during a voyage from London to Calcutta, 1857.

3. From Dr. G. Von Liebig.—

First. An account of a Cyclone in the Andaman Sea on the 9th and 10th April, 1858.

* The same man who was in Calcutta.

Second. An account of a visit to Barren Island. This paper was read to the Meeting by the Chairman.

4. From Capt. G. H. Saxton, 38th M. N. I., Cuttack, the following note on the last shock of an earthquake.

"I beg to bring to your notice, that this place was yesterday visited by a slight earthquake. As it may be thought desirable that such an event should be placed on the records of the Society, I am induced to write. The shock took place at 25 minutes past 3 o'clock in the afternoon, and was of considerable violence, sufficient to give a feeling of giddiness; it was not accompanied by any thing unusual atmospherically or otherwise. There was a slight breeze at the time, and light clouds. In the bed of the river close by, the sand rose and drifted as though the breeze was stronger there, as at this season (during the rains) it does not so readily rise. The peculiar position of the earth with reference to the sun and moon, is remarkable, the occurrence taking place about a couple of hours before a lunar eclipse. The shock lasted for a very few seconds. The vibration of a set of ricketty shelves with glasses close by where I was sitting, continued after the shock and was a very palpable evidence of the amount of violence."

The Chairman communicated to the Meeting the following information regarding a flood of the Indus.

"At 5 A. M. on the 10th August, the Indus at Attock was very low. At 7 it had risen 10 feet. By half past twelve in the afternoon it had risen 50 feet, and it continued to rise till it stood 90 feet higher than it did in the morning. The exact hour of greatest flood is not mentioned.

The Cabul river continued to flow upwards for 10 hours!

At Nowshera the whole station was entirely destroyed, excepting the public buildings which are all uninjured. But the water was several feet deep in the barracks.

The above facts are derived from a letter from the Deputy Commissioner of Peshawur.

A similar flood occurred in 1841.

There is no doubt that the present flood, like that of 1841, was caused by landslips among the mountains blocking up the river in the upper part of its course. The obstruction suddenly giving way

after a great accumulation of water had taken place produced the results mentioned.

The obstruction in 1841, was formed somewhere below Hasora. The spot was visited by the late Messrs. Winterbottom and Agnew, a year or two after the flood.

The water on that occasion is believed to have risen 800 or 900 feet above its usual level at the landslip, and the stream is said to have been stopped as far back as to Gilgit, or nearly as far.

In 1841 a Brigade or Division of the Sikh Army was encamped near Attock when the flood took place, and was swept entirely away. On the present occasion it is understood that the loss of life has not been great."

The Librarian submitted his usual monthly report for August, 1858.

Library.

The following books have been added to the Library during the month of August, 1858.

Presented.

Journal of the Indian Archipelago and Eastern Asia, Vol. II. Nos. 2 and 3, 2 copies.—By the Editor J. R. Logan, Esq.

Madras Journal of Literature and Science, January to March, 1858, Vol. III. No. 6.—By the Madras Literary Society.

Proceedings of the Academy of Natural Sciences of Philadelphia, January, 1858.—By the Academy.

Report (20th) of the Proceedings of the Calcutta School-Book Society, 1857.—By Babu Rajendralal Mittra.

Ditto (Half-yearly) of the Chamber of Commerce, 31st May, 1858, 8vo. —By the Chamber of Commerce.

Ditto (12th Annual) of the Grant Medical College, *Bombay*, Session 1857-58.—By the Govt. of Bombay.

Selections from the Records of the Government N. W. Provinces, Mr. Thomason's Despatches, Vol. II. *Calcutta*, 8vo.—By the Govt. of India.

Ditto ditto ditto Part XXXI. 2 copies.—By the Same.

Ditto ditto of the Government of Bengal, No. XXVIII.—By the Govt. of Bengal.

Vividhartha Sangraha, No. 49.—By Babu Rajendralal Mittra.

The Oriental Christian Spectator for July.—By the Editor.

The Calcutta Christian Observer for August, 1858.—By the Editor.

The Oriental Baptist for August, 1858.—By the Editor.

Erlauterungsblatt zum Relief des Monte-Rosa und Seiner Umgebungen.—By Herr. H. Schlagintweit.

Bijdragen tot de Taal-Land-En-Volkenkunde van Nederlandsch Indie, Deel I. Nos. 3 and 4.—By the Academy.

Correspondence between the British Indian Association and Government, *pamphlet.*—By the Secretary B. I. Association.

Journal of the Statistical Society of London, June, 1858, Vol. XXI. Part II.—By the Society.

Moore, (F.) Description of some new species of Lepidopterous Insects from Northern India, pamphlet.—By the Author.

——— A Monograph of the Asiatic Species of Neptis and Athyma, *pamphlet.*—By the Author.

Ratnavali an Indian Drama in Bengali, by Ramnarain Pundit, *pamphlet.* —By the Raja P. C. Sing.

——— An English Translation of the same, by M. M. S. Dutt.—By the Same.

Werken van het ke Institut voor Taal en Volkenkunde, van Nedarlandsch Indie, 2 Affeeling, *Amsterdam,* 1858, 8vo.—By the Royal Institution of Netherlands.

Exchanged.

Athenæum for May, 1858.

Annalen der Chemie und Pharmacie, April, 1858.

London, Edinburgh and Dublin Philosophical Magazine, No. 102, for June, 1858.

Purchased.

Annals and Magazine of Natural History for June, 1858, No. 6.

American Journal of Science and Art for May, 1858, No. 75.

Annales des Sciences Naturelles, Tome VIII. No. 1.

Belanger's Voyage Indes Orientelles, Parts I. to VIII.

Comptes Rendus, Nos. 19 to 22.

Dumeril's Histoire des Reptiles, Vols. 6 and 7, Parts I. II. VIII. and IX. Plates for Vols. 6, 7, 8, 9 and 10.

Deutsches Wörterbuch, Vol. II. Part 6.

Journal des Savants for April and May, 1858.

Literary Gazette, Nos. 2157 to 2160.

Prinsep's Spays, Vols. I and II, 8vo.

Revue des Deux Mondes, 15th May and 1st June, 1858.

——— de Zoologie, No. 4, 1858.

Voigt's (J. O.) Hortus Suburbans Calcuttensis, 8vo. *Calcutta,* 1845.

Wyld's Map of India.

Wustenfield die Chroniken der Stadt Mekka, Band III. *Liepzig,* 8vo.

Iconographie Zoophytologique Description par localites et terrains des Polypiers fossiles de France et Pays environnauts par H. Michelin, *Paris,* Plates.

For October, 1858.

The Monthly General Meeting for October, was held on the 1st instant.

The Hon'ble Sir James Colvile, Kt., President, in the chair.

The proceedings of the September Meeting were read and confirmed.

Presentations were received—

1. From the Government of India through Mr. Secretary Edmonstone, copy of a Persian work published by Dr. Polock the physician of the Shah of Persia, relating to the diseases prevalent in that country and their treatment.

2. From the Hon'ble the Court of Directors through the Government of Bengal, photographic drawings of the Gol Goomuz at Beejapore.

3. From Baboo Rungolal Banerjee, a copy of his Bengalee Poem Pudmini.

4. From Mr. Theobald, Junior, through Baboo Rajendra Lal Mittra, certain coins as described by the Baboo in the following note.

"My dear Gour,—Sometime ago Mr. Theobald, Junior, left with me 7 silver coins for presentation to the Asiatic Society, if I thought them worthy of its acceptance. I find the first 3 to belong to the Shah Kings of Saurashtra, No. 1 being of Vira Dama son of Dama Shah, No. 2 of Atri Dama son of Rudra Shah, and No. 3 of Bisva Shah, son of Bhathri Dama. The Society possesses no specimens of these coins and they will therefore be useful additions to its cabinet. They have been figured in the Journal and in Mr. Thomas's Indian Antiquities, Vol. II. p. 85.

Nos. 4 & 5, the last in triplicate, are very like the silver dabs found by Major Kittoe, Mr. Thomas and others in Gangetic India, and are supposed to have belonged to Hindu Kings of the 2d and 3d centuries before Christ. They bear no inscription, and their legends are indistinct. They were I understand found in Guzerat.

Yours truly,

(Sd.) Rajendra Lal Mittra.

The Council reported—

1. That the name of Baboo Roma Nauth Banerjee has been removed from the list of Members, under rule 13 of the Society's Code of Bye laws, for non-payment of arrears.

2. That they have granted the Asst. Secretary and Librarian Baboo Gourdoss Bysack leave of absence for 6 months upon urgent private affairs, and appointed Baboo Bhobany Persaud Dutt to act for him during his absence.

Confirmed.

Communications received—

1. From Baboo Radha Nauth Sikdar, an Abstract of the Meteorological Observations taken at the Surveyor General's Office in the month of May last.

2. From Mr. James Burgess, a paper on Hypsometrical Measurements by means of the Barometer and Boiling Point Thermometer. This paper gave rise to considerable discussion chiefly maintained by Colonel Strachey, Dr. Thomson and the author.

3. From Baboo Hori Sunker Dutt, Deputy Inspector of Schools, Bancoorah, through Mr. Hand, the Inspector of Schools, South Bengal, the following letter accompanied by a brick bearing a Bengal Inscription.

" I have the honor to submit for your consideration a brick which I have found in the ruins of the old temple of the *Devee Basoolee* at Chhatna in Zilla Bancoorah. This Devee is alluded to in the Poems of Chundee Doss, one of the well known bards of Bengal, and this excited my curiosity to pay a visit, on one occasion of my going to Chhatna on duty, to the scene of events now so popular with numbers of our countrymen. Here the villagers pointed out the place where Chundee Doss's dwelling stood, the stone upon which he used to sit and compose his songs, and the old site of the

temple of the Goddess to whose worship he was devoted. These no doubt had some peculiar charms, and I was still more delighted when I observed that almost all the bricks of the temple bore inscriptions which I at first could not read. I therefore looked for an entire brick, and at last found the one I now submit for your consideration.

My main object in thus intruding upon your time is to have the inscription deciphered.

I must inform you that I tried if possible to decipher it. I think I have partially made out some thing, but am very diffident as to whether my conjectures are correct.

The characters at first appear much like Deva Nagor, but I think they are old *Bengali.*

What I have been able to make out is this:—

সাঃ ছাত্মা নগরেশ শ্রীযুতরবায় শক ১৪৭৫

The temple seems from this to have been built by the Rajah of Chhatna.

I have much doubt about য়

If these are old Bengali characters, I would be happy to have the other letters of the alphabet, in order that the great change which those characters have undergone during the last three hundred years, may be noticed.

I have, &c.,

(Sd.) Hori Shunker Dutt.

Baboo Gourdoss Bysack stated that the characters of the inscription were Bengalee of the period of Chaitanya Deva, and very like those of Lassen's fac simile edition of the Yajnadattabadha.

They differ from the modern Bengali in the letter ব় being written like ব without the dot at the bottom, and the latter being represented with a dot in the centre. This practice still obtains in Coch Behar and is not unknown in Rungpur. The letter শ্রী is very peculiarly formed and its duplication is indicated by the addition of the figure 2, and not as usual at present by the repetition of the letter itself. This mode of duplicating the *Sri* was not, however, uncommon at the time when the brick was inscribed. In some of the Nepalese coins of the 16th and 17th centuries figured by Marsden in his Numismata Orientalia, it occurs very frequently, and in a

coin of Rajrajesswari Devi the letter Sri has the figure 3 after it to indicate its triplication. The date of the inscription 1475 Saká= 1553, A. C. has been correctly read by Babu Hurrishanker Dutt, but the name of the party who dedicated the temple is not Sri Yutara. Raya as read by him, but Sri Sri Utava Raya. The reading of the Inscription is

শ্রী২ ছাতনা নগরেস শ্রী২ উতবরায় সক ১৪৭৫

or in English.

The doubly prosperous Utava Raya the owner of the doubly prosperous city Chhatana, Saka, 1475.

4. Lieut.-Col. Strachey read a memo. by Capt. H. Strachey on what is known of the proceedings and fate of Herr. Adolphe Schlagintweit.

For November, 1858.

The monthly general meeting of the Society was held on the 3rd instant.

Col. R. Strachey, Vice-President, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received.

1. From the Secretary of the Royal Geographical Society, the 27th vol. of the Society's Journal.

2. From the Secretary of the Ceylon Asiatic Society, part 2 of that Society's Journal.

3. From the Secretary American Academy of Arts and Sciences, Memoirs of the American Academy, New series vol. V. p. II., and vol. VI. p. I.

Letters were read.

1. From Dr. Row intimating his desire to withdraw from the Society.

Communications were received.

1. From the Government of India through Mr. Secretary Chapman forwarding for such use as the Society may think fit, a paper on

Education in China prepared by Mr. Alabaster from information communicated by Commissioner Yeh.

2. From Mr. Hall a paper on Professor Wilson's 3d edition of the Sanscrit Dictionary.

3. From Captain Tenant, Engineers. A reply to Archdeacon Pratt's recent paper on the Indian meridional arc.

4. From Major H. L. Thuillier the following extract from a letter from Captain Tenant relating to the Comet.

"As the comet now rapidly leaving us has been generally identified with the one Mr. Hind expected, (which it is not,) and has in consequence caused an unusual interest to be taken in it, perhaps the elements of its orbit will be interesting to some of your Calcutta friends.

Perihelion passage, Sept. 28th, 16h. 16m. 5.

Longitude of perihelion, 16· 36′ 4.″

Do. Ascending node, 168· 25′ 11.″

Inclination, 66· 20′ 35.″

Perihelion distance, 0.5 752,358.

Motion retrograde.

These differ totally from those of Mr. Hind's expected Comet, that of 1556.

I was unable to get any observations till the 5th October, and have only just got enough to get this orbit, but I believe this orbit will be very fairly close. I have seen no English orbit and I doubt if any has yet reached India."

The Secretary read the following extract from a note addressed to him by Archdeacon Pratt on the same subject.

"This comet is the same as that seen by Dr. Donati at Florence in June last. Mr. Hind has published one or two letters in the *Times* giving the results of his observations upon it. It is not, as was at first hoped, the 1556 or Charles Vth comet, which may yet come. From 1858 to 1861 is the range which Mr. Hind has given it.

Regarding this, or Donati's comet, Mr. Hind shews, in his letter dated September 13th, that on the 5th and 6th of October it would be near Arcturus—which you may remember we observed—and that it would pass its descending node near Venus—which also we

saw here plainly enough on the 17th or 18th of October. The motion of the comet is retrograde ; for Venus is come to this side of the sun from the opposite side by the left, whereas the comet is come round by the right. The motion round the sun is consequently opposite to that of Venus and the other planets. This is fatal to its being Charles V.'s comet, if, as I believe is the case, that comet's motion was direct. No perturbations from the Planets could account for such a change."

5. From the Government of India through Mr. Secretary Beadon, transmitting 3 copies of a letter from the Government of the N. W. Provinces to the Secretary with the Governor General with enclosures relative to Mons. Adolphe Schlagintweit.

From Major H. Ramsay, *Commissioner of Kumaon Division, to* W. Muir, *Esquire, Secretary to Government, North Western Provinces, No.* 335, *dated Nynee Tal, the* 6*th September*, 1858.

Sir,—When the Messrs. Schlagintweit left this province to prosecute their scientific inquiries in more northern countries, several Kumaon men accompanied them. Most of these men returned long ago, but Hurkishen came last of all, and after making inquiries about Adolphe Schlagintweit, he requested me to settle his accounts and receive his instruments.

2. As Captain Strachey had some knowledge of the country from which Hurkishen had returned, as also of those parts where he was to carry out further observations, I requested that officer to prepare a statement showing all that could be gathered from Hurkishen—the instruments he had received from A. Schlagintweit, and how disposed of, also the expenditure of the money he had received. Captain Strachey, at considerable trouble, has kindly prepared the enclosed memorandum with map to explain the known and probable route of the missing traveller, and I solicit the favor of your submitting it for the orders of the Right Hon'ble the Governor General.

I solicit orders regarding the pay of Hurkishen recommended by Captain Strachey, as also in reference to the collections and instruments left at different places.

MEMORANDUM.

1. Adolphe Schlagintweit crossed the Para Lasa (Pass) from Garzha (*viâ* Lahaul) of Kalla into Rapslin of Ladak, *i. e.* from India to Tibet, on the 31st of May, 1857, taking with him

1. Mahomud Amin, native of Yarkund, guide, &c.
2. Yahudi ditto, Assistant to No. 1.
3. Mahomud Hasan, of Peshawar, Moonshee, &c.
4. Abdul of Kashmir, domestic servant, &c.
5. Ghos Mahomud, of Moradabad, ditto.
6. Murli, of Bhagsu, Chuprassy, &c.
7. Moula Baksh, of Moradabad ditto, and others.

2. The first of these, Mahomud Amin, was a person of questionable antecedents, nominally a merchant trading between Yarkund and Le, but said also to have acted in the capacity of a gang-robber on the road between those places. Being at Le in 1856, he was arrested by the Dogra Thannadar Basti Ram, for debt, on the suit of sundry merchants or for other reasons, and released on the application of Herman and Robert Schlagintweit, who engaged him to act as guide for their journey towards Khotin in the summer of that year (their account of which is on record). On their return to India in the autumn, he was discharged and remained at Le, when he soon got into trouble again with the Dogra Government.

3. Some say that Agents of the Chinese Government in Yarkund having heard of his bringing European travellers across their frontier (which is high treason in their Code), offered a reward of 1,000 Rupees for his apprehension, and perhaps coerced some of the Kashmir residents at Yarkund to work upon their friends in Ladak and Kashmir for the same object, which Gulab Singh and Basti Ram possibly also turned to a mercantile transaction. However this may be, Gulab Singh having ordered his arrest and threatened to hang him soon after the Schlagintweits' departure, he fled from Ladak into Kulla, where Adolphe Schlagintweit found him at Sultanpore in April 1857. There had possibly been some previous arrangement between them. Any way Adolphe Schlagintweit again entertained him as Interpreter, Guide, and Baggage Master for another journey into Turkistan. As a specimen of his veracity, it may be mentioned that he informed deponent

(Hurkishen) that he was to have a monthly salary of 2,000 Rupees whilst travelling with A. Schlagintweit, and a monthly pension of 1,000 Rupees after he had brought him back safe to India. Major Hay, A. C. of Kulla, probably knows more of Mahomud Amin's history.

4. No. 2, name not known to deponent (Hurkishen), being commonly called "Yahudi," *i. e.* "The Jew," was a native of Yarkund and dependent of Mahomud Amin: they had some baggage poneys with them and four Turkish grooms or baggage men, all of which were engaged by A. Schlagintweit for the journey. No. 3, Mahomud Hasan, of Peshawar, was engaged by A. Schlagintweit when he was at that place in December, 1856, as a Moonshee, assisting also in scientific observations and accounts.

5. The last documentary evidence of A. Schlagintweit's movements forthcoming here, consists of a letter to Hurkishen from Changehenmo of Ladak, 14th June, a postscript to the same stating that it was not sent till the 24th idem, and one or two notes for sundry payments of money of the latter date. The letter consists chiefly of instructions to Hurkishen, and of Adolphe Schlagintweit himself, only says, "I am quite well, and at present all things seem to go on pretty right," but as it also mentions two "Dâk parcels," one for Lieutenant Charles Hall (A. C. of Bhagsa?) sent by the same despatch for transmission to Kangra. Other persons have no doubt received letters from him with particulars of his history up to that time.

6. These documents were brought from Ladak by the chuprassies Murli and Maula Baksh (Nos. 6 and 7 of the above list) who joined Hurkishen at Kharding of Garzlia on the 20th of July, 1857. It appeared from the statements of these men (made to Hurkishen) that before they left A. Schlagintweit, the Moonshee Mahomud Hasan had deserted, taking with him one of his Master's (or Mahomud Amin's) poneys, some little money, and other articles belonging to A. Schlagintweit. The chuprassies were directed to overtake him if they could, recover the property, and make it over to Hurkishen in Kullu, which they succeeded in doing, but leaving the Moonshee himself in Ladak, whence he probably made his way to Kashmir and Peshawar. He gave them a letter for his Master,

which they brought to Hurkishen and is still extant among his papers, written in pencil in broken English, excusing his sudden departure on the score of inability to endure the hardships of such a journey any longer, and admitting a balance of 72 Rupees, of which he gave the chuprassies his account, but did not pay the money. It must be observed that A. Schlagintweit makes no allusion to all this in his letters to Hurkishen; from which it may perhaps be inferred that he did not attach much importance to the Moonshee's desertion.

7. Hurkishen, when at Deyra in November, 1857, gathered from Captain Montgomery of the Trigonometrical survey and his native doctor, that they had been in Ladak during the past summer, and that A. Schlagintweit had left Le before their arrival there, and they knew nothing more of him.

8. From the locality of his last despatch, Changchenmo, (which may be seen in my map, at the N. E. end of Ladak) I infer that he crossed the Turkish water shed to the east of the Karakorum Pass, perhaps to Sugat, on the head of the Karakash River, and thence following the route taken by his brothers the year before, towards Kilian and Khoten.* It appears that he had laid in a stock of merchandize in India, with the view of facilitating his journey by trade or the appearance of it.

9. I hear of him after this through the Bhotiyas of Iwar, who got their information from Kashmiris of Ladak at the Gar fair in the autumn of 1857. It was to the effect that A. Schlagintweit had succeeded in reaching the margin of the inhabited country at the foot of the mountains; there he went out from his camp some way to reconnoitre, and in his absence the Guide, Mahomud Amin, absconded with most of the baggage and cattle towards Yarkund. A. Schlagintweit being left helpless, sent back some of the Ladak baggage-men he had brought with him with a letter or message to the Thannadar of Le, requesting him to send assistance in men, cattle, provisions, and money; whether for the purpose of continuing his attempt to penetrate into Turkistan, or merely to return to Ladak with less hardships, does not appear. When his messengers

* There is also a way through Kokrang and Dong Ailak, by which he might get into the ordinary route on this side of the Karakorum.

arrived at Le, they found Basti Ram's son in authority there, the Thannadar himself being away in Kashmir. The son is said to have refused the required assistance: more likely, in fact, he was too silly and timid to act upon his own responsibility, and referred for instructions to his father or Gulab Sigh, in Kashmir, at the expense of great delay and danger to A. Schlagintweit. The information gathered by the Iwaris at Gar goes no further, and is not very reliable even so far: indeed it is a question whether this story may not be an exaggerted mis-statement of the desertion of Mahomud Hasan in Ladak.

10. The next accounts are derived from two or three letters which have been published during the last few months in the *Delhi Gazette*, from a correspondent of that paper, apparently at Simla, and deriving his information from merchant travellers from Ladak. From these it may be gathered that Adolphe Schlagintweit passed the winter of 1857-58 at the foot of the mountains on the border of Khoten, on this side of the Chinese out-post, among the same tribe of shepherds perhaps who gave his brothers a friendly reception the year before. On his arrival there, the Provinces of Kashgar and Yarkund were in a very disturbed state from one of those invasions of the Turks from Khokund which have been recurring periodically every 10 or 20 years, during the past century.

11. On these occasions the forage invaders being joined by the Turks of the country, usually succeed in driving the Chinese Garrisons into their forts, and subverting the Celestial Government for a time, till re-inforcements come from the Chinese Provinces further east, when the rabble of Turks soon become disorganized, the Khokandis retire to their own country, and the people of Yarkund and Kashgar are left to settle their own accounts with the Chinese, which is sometimes done by wholesale massacres of the Turks of those cities. The invaders are commonly headed by one of the Khojahs of Andejan, of the family which ruled at Kashghar, before the Chinese conquest (about 100 years ago), and who still aspire to the recovery of their former dominions. An unsuccessful invasion and rebellion of the Turks, as here described, occurred when I was in Ladak in 1847-48; on the present occasion the result is said to have been the same.

12. So long as the Chinese were in the ascendant, Adolphe Schlagintweit would have little chance of penetrating the inhabited country to any distance: they have out-posts on all the roads across their frontier; from the rarity of population and traffic, individuals are easily marked; and Adolphe Schlagintweit would hardly be able to barbarize himself enough to bear scrutiny. An European traveller attempting to pass any of these out-posts would probably be stopped and turned back, and extra precautions taken against him all along the frontier, but if detected after penetrating the inhabited country to any distance, he would more probably be murdered. It is not likely that Adolphe Schlagintweit would stay more than one winter in the demi-deserts this side of Khoten, nor that if still there he would not have opened communications with Ladak and India; it is probable therefore that he took the opportunity offered by the temporary subversion of the Chinese authority to enter Khoten or Yarkund. But to go far or stay long there he could hardly avoid the notice of the insurgent Turks: the natural impulse of these people would be to rob and murder an European, but in the actual conjuncture, they might perhaps welcome him as a common enemy of the Chinese, and the mania of travel or adventure might prompt Adolphe Schlagintweit to offer himself in that capacity. In either case when the Chinese got the upper-hand again (as they are now said to have done), they would first regain possession of their southern frontier towards Ladak, and Adolphe Schlagintweit would probably retire with the invading Turks through Kashghar into Khokund.

13. The relations of the English with Khokund have been very slight, but so far as they go, wholly amicable, and on the strength of them, or of his own antecedents in Yarkund, Adolphe Schlagintweit might possibly meet a friendly reception there: on the other hand the Khokandies are (as usual with the Turks) on bad terms with all their neighbours, including the Russians, who are steadily encroaching on their North-West frontier; and this would add to his difficulties in leaving their country again.

14. The ways out of Khokund are eastward to Ili and South-Eastward to Kashghar, both completely stopped by the Chinese; Southward to Sirkol Badakshan and Cabul, but physically and

politically this would be most difficult; South-West to Samarkund and Bukhara, and Westward to Khiva, both countries probably hostile to Khokund, and certainly so to the British; an European, and especially an English traveller, would find safety there only from *Russian* protection; lastly to the Russian out-posts on the North-West and North, Fort Aralsk near the Aral and Ak-Musjed on the Sir (Jaxartes): once there, he would be in the civilized world again, under a friendly Government, and if he ever re-appears, I think it is most likely to be this way, which would lead him to Europe and not back to India. It would be futile to discuss the chances of his ultimate escape: they hang merely on the caprices of the vilest barbarians of Central Asia.

15. To return to India: some time in May 1857, before Adolphe Schlagintweit left Garzha, he detached a party consisting of

1. Ramchunder, of Lahore, Collector and Observer.
2. Gulab Sing, of Mandi, Draftsman and Assistant to No. 1.
3. „ „ Compassy.
4. „ „ Ditto.
5. „ „ Gardener and Botanical Collector.
6. „ of the Sultanpore Thannah, Chuprassy.

These under No. 1 were sent from Khardong down the Chaundra Bhogah by Kishtwar into Kashmir, with orders to turn up at Jhelum and there wait for Adolphe Schlagintweit himself or his further orders; as before mentioned they met the surveyors under Captain Montgomery in Kashmir, and this is the last, deponent has heard of them.

16. On his departure from Garzha, Adolphe Schlagintweit also left 7 Nagina, of the Sultanpore Thannah, chuprassy, in charge of collections and manuscripts deposited in the Assistant Commissioner's house at Khurdong.

This man was afterwards joined by 8 Moula Baksh, No. 7 of the first list, one of the two chuprassies who returned from Ladak in the end of July, and after taking on letters to Sultanpore (as already mentioned) brought back money (200 Rupees) for expenses at Khardong. Nos. 7 & 8 were ordered to remain at Khardong till receipt of further orders from Adolphe Schlagintweit and to take

care of his collections there till they could be sent down to Kangra after the rains. Deponent knows nothing more of them.

17. The 3rd party consisted of

9. Hurkissen Tewari, of Almorah, Native Doctor, Observer, and Collector.

10. Krishna	„	ditto,	Assistant to No. 9.
11. Panchum	„	Paori,	Compassy.
12. Magna	„	Kullu,	ditto.
13. Sirtaj	„	ditto,	ditto.

The first of whom No. 9 is the person from whom most of this information is derived. They parted from Adolphe Schlagintweit when he crossed the Para Lassa into Tibet, on the 31st May, 1857. During the month of June, they were employed in travelling, making observations and collections down the Bhagga valley by Shigri and Kaksan back to Khardong, where they remained till the return of the two Chuprassies from Ladak, 20th July. In pursuance of the instructions then received, they proceeded by Koksar and Shigri again, across the Kulzun-La into S. Pite, where they were joined in August by 14 Murh, No. 6, of the first list, who after leaving the despatches from Ladak at Sultanpore, brought back a supply of money (500 Rupees). The party then continued their journey through Haugrang and Kundur, up the Baspa valley across the Rupin Pass into Rawain, and thence to Deyra, arriving 11th October. Hurkishen hearing a bad account of the road across the Rupin, sent the Chuprassy Umrli, with the poney recovered from the run-away Moonshee Mahomud Husan, round by lower Bischr, in spite of which the animal died on the road at Rampore, as certified by a letter from the Raja of that ilk.

18. Hurkishen's instructions were to go on to Futtehgurh, and expect Adolphe Schlagintweit there by the end of October, but the disturbed state of the country in that direction rendering this impossible, he remained at Deyrah, making observations, repairing instruments, and expecting letters from Adolphe Schlagintweit till the 12th of December. Getting no news of his master, he then deposited his collections in the Surveyor General's Office, discharged some of his Establishment (Nos. 12, 13, and 14), and proceeded

to Paoree, 25th December, 1857, and Almora, 1st January, 1858, in hopes of there getting some information or instructions.

He remained in Kumaon, making many fruitless inquiries, till the 18th February, and then returned to Paoree 2nd, and Deyra 17th March, 1858.

Finding no news of Adolphe Schlagintweit, he then left the rest of his collections and some broken instruments in the Surveyor's Office, dismissed the rest of his Establishment (Nos. 10 and 11), brought his observations and collections to an end, and retuened to his home at Almorah, in April 1858.

In he wrote for information, about Adolphe Schlagintweit to the Chief Commissioner's Office in the Punjab, and the answer of the Secretary, dated Lahore, the 1858, states that they can give him none.

19. 1*st.*—Hurkishen left in Gorgha in July, 1857,

2 cases of collections, containing

with the Reverend A. W. Heyde, a German Missionary settled at Kyelang (near Khardong.)

2*nd.*—In the Surveyor General's Office at Deyra, in December, 1857,

7 cases of Geological Specimens, *viz.*,				3 Rocks and Fossils.
				2 Earth and Sand.
				2 Water.
1 Ditto	Botanical	ditto	„	Plants.
1 „	Zoological	„		Birds.

in all, 9 cases and about a cart load.

3*rd.*—Instruments ...... 1 Barometer, broken.
1 Thermometer ditto.

4*th.*—Ditto ...... 1 Tent.
1 Boring-tool.
1 Hammer.

5*th.*—He has got with him at Almorah

Instruments ...... 1 Barometer, damaged.
2 Prismatic compasses.
1 Pocket ditto.
1 Strike and dip compass, German.

1 Thermometer.
1 Ditto broken.
1 Ditto ground.
2 Ditto dry and wet bulb.
1 Measuring glass.
1 Ditto rod.
3 Ditto tapes.
1 Sundial.
1 Watch.
1 Magnifying glass.
Papers .... 2 Sheets of map.
5 Books of observations and references of collections.
1 Ditto accounts.
1 Ditto ditto, Persian, of Mahomed Hossein.

Peshawri, and other papers.

6th.—One case of Surgical instruments (received from the Almorah Dispensary).

2 Compasses Tripods.
1 Hammer.
1 Gun and bullet Mould.
2 „ „ „ Bags.
1 Inkstand, &c.
1 Chuprass.

20. The observations appear to have been regularly kept, according to Schlagintweit's instructions, from Para-Lassa 31st May, to Paoree 25th December, 1857, and again in a fragmentary way between Paoree and Deyra from 2nd to 17th March, 1858.

21. I have examined Hurkishen's accounts and find them regularly kept. He received an advance of 400 Rupees from A. Schlagintweit on the 31st May, and 500 Rupees by order on Sultanpore, cashed in August 1857, together 900 Rupees, the whole of which seems to have been fairly expended and duly accounted for. This covers Hurkishen's own pay at 30 Rupees per month, up to the end of December, 1857. Hurkishen himself states that A. Schlagintweit promised him a further payment of 25 Rupees per month,

making his salary up to 55 Rupees, if, on the winding up of his affairs, his work should be found satisfactory; but there is no allusion to such a promise in any of the documents produced by Hurkishen, and one of them distinctly states his pay to have been *raised to* 30 *Rupees*, from the 1st of May, 1857, Hurkishen himself admitting that it was only 25 before that. I should myself consider 30 Rupees as adequate to the style of his work. Since the beginning of January, 1858, Hurkishen has done next to nothing in the way of observation or collection, and has been for a large part of the time at his own home; on the other hand, he has been put to some inconvenience and kept out of other employment. For this I think that a sum of one hundred Rupees (100) would be a fair remuneration. There also remains due ten Rupees (10) to the Assistant Krishna, No. 10 of the 2nd list, for wages from 1st December 1857, to 5th January, 1858, at nine Rupees per month, and ten Rupees (10) to Compassy Punchum, No. 11 of the same, for wages for March and April, 1858, at five Rupees per month.

22. I am of opinion that if Adolphe Schlagintweit does not return to India, or at least to Ladak, within the next three months, his return this way should be no longer expected; that any of his establishments still extant should be finally discharged, and their accounts closed, and that all collections, manuscripts, and *graduated* instruments should be got together, sealed, packed, and sent to England, to be kept at the London Custom House unopened till called for by his brothers Herman and Robert (from Berlin*), who should be at the same time advised to make arrangements for receiving them. This is the best way of recovering some value from what has cost the Government much money, of furthering the interests of science, and doing justice to the Schlagintweits themselves. I think that *all graduated instruments whatever* should be sent home, because the final reductions of many observations depend upon the correction of instrumental errors which are sometimes ascertainable only by a *subsequent* reference to the instruments themselves, some useless things may be included thus, but in the absence of the Schlagintweits, it is safer to make the rule absolute and send all.

* Behrew. Strasse No.

23. It would be very desirable to have all the collections repack-

ed for transmission to England, as the original packing may in many cases be insufficient, but as this would involve much risk of displacing labels, &c., (which might impair the scientific value of specimens) it should be done only by the individuals who collected them, if forthcoming; by any other hands, the packing should be confined as much as possible to the cases themselves, and avoid any turning over of the contents. Every thing should be completely closed in soldered tin-plates.

24. With this view, I recommend that the instruments and papers specified in list No. 5, be taken from Hurkishen, sealed, packed, and deposited in the Commissioner's Office at Almorah, against further orders, and himself and two men then dismissed after payment of the 120 Rupees due to them (as shown above), the things mentioned in list No. 6 (of very little value) being disposed of as the Commissioners may direct. It is a question whether after this Hurkishen should not be sent to Deyrah, to repack the collections which he left in the Surveyor's Office there, being remunerated for the job by a further payment of 50 Rupees or so. Colonel Waugh might be consulted on this point.

25. I am further of opinion, that Government should call upon some of their officers in the Punjaub, to report any information they may be able to get about Adolphe Schlagintweit, and to take measures, such as suggested above, for the preservation of any collections, manuscripts, and instruments that may come within their reach, the whole of which things should be sent after the rains to the Secretary to Government at Allahabad, who could make further arrangements for their transmission to England in one batch. The parties best to be consulted are—

The Deputy Commissioner at Kangra.

His Assistant in Kullu.

The Deputy Commissioner at Simla.

Any Government Agent in Kashmir or Ladak.

The Surveyor General at Deyrah.

His Assistants in Cashmir and Ladak.

The Reverend A. W. Heyde, German Missionary at Kyelang, in Lahaul of Kullu.

Maharaja Ranbir Sing of Kashmir, and Billah Sah, his Collector of customs in Ladak.

26. If Nasir Khan, native of Bajour, domiciled at Guzerat, and trader between Turkistan and India, be forthcoming in Ladak, he would be about the best man to entrust with any further inquiries in Turkistan itself; but if any such commission were given to him, it should be quite privately. I gather from the *Delhi Gazette*, that this person passed from India into Ladak a month or two ago, with the intention, no doubt, of going on to Yarkund.

(Signed) Henry Strachey, *Captain*,
66th Goorkah Regiment.

Almorah, *20th August*, 1858.

P. S.—Since writing the above, I have met with the following in the *Bombay Standard* of the 17th July, 1858: "By letters from Simla of the 3rd instant, we learn that an expedition was about to be organized under Lord William Hay, to ascertain, if possible, the fate of Herr Adolphe Von Schlagintweit."

(Signed) Henry Strachey, *Captain*,
66th Goorkah Regiment.

Delhi Gazette, June, 1858.

No. 1.—News has been received of Mr. Schlagintweit, who is said to have passed his winter at a place called Askilung, about five marches on this side of Yarkund, and near Aktak. It is possible that the Government is wide awake, and that Mr. Schlagintweit was deputed to that part of the world by competent authority, and that he is duly protected; if this be not the case, the news of his safety should be regarded with great caution, and the persons who have brought the news should be very closely questioned. The news has come from Leh *viâ* Zautkar, and the secrecy of Government may be so great that the same parties may have conveyed letters from Mr. Schlagintweit himself.

Delhi Gazette, July 10, 1858.

No. 2.—News from Yarkund has been received by us from a friend, upon whose information we can entirely rely, he says—"The passes from Ladak are open, and news has been received that the army of Kathai (China) engaged the force sent from Indijan (Kohkan) and defeated them, causing them to return to their own country.

From the present meagre account, the encounter does not seem to have been very bloody, in fact it seemed to be more an arrangement between themselves.

Messengers of distinction have been passing from the Shassan Court to Yarkund, holding secret conferences with the Thannadar at Leh, the meaning of which did not transpire. I am sorry to tell you that no news whatever has been received of Mr. Schlagintweit or the man Mahomed Amin who conducted him to that country. The news formerly being, that Mr. Schlagintweit had identified himself with the Indijan party, which party has been conquered by the Chinese, would place him in an awkward position, and as he would have been unable to pass the Chinese posts to return to Leh, he would have, of necessity, been obliged to retire with the beaten army towards Kohkan."

Delhi Gazette, July 17, 1858.

No. 3.—A merchant named Nasir Khan, came to Hindoostan about two years ago nominally on a pilgrimage to Mecca, where he proceeded. He returned at the beginning of the hot weather to Sultanpore in Kulu, where he took up his residence, some of his people joining him from Bombay, and others *viâ* Calcutta. He has remained several months in Kulu, and was narrowly watched by Major Hay, who was of opinion that he had other motives than those of trade.

Being anxious apparently to return to Yarkund, and wishing to know the exact state of that country, he paid a man 15 Rupees to proceed to Ladak before the passes were considered fairly opened. About a fortnight ago, this messenger brought him a letter informing him that the Chinese force had driven back the troops of Indijan, which attacked Yarkund last year when they were ill prepared for resistance; nor are the Chinese of Yarkund allowed to assemble troops without orders from Pekin. However, the important portion of my story as regards Runbeer Singh is to come. This letter stated that 200 of the rebel sepoys fully armed had been allowed to pass through the Kashmir territory, and had actually arrived in Yarkund!! Nasir Khan is a Patthan, and communicated this to the Native Officer of the guard of the detachment of the Police corps now stationed at Sultanpore.

Who can tell what is going on up there ? I met a few days ago two Mahomedans who had arrived from Leh in 19 days, just to cross the Sutledge to Rampoor. One a Kashmiri told me, that Mr. Schlagintweit was alive, and that he had gone on to Kashgar, with Mahomud Amin, the native who accompanied him from Kulu. If true, this is a curious move for him to make, and the Chinese would certainly never allow him to return the way he went to Yarkund.

(True copies)

(Signed) W. H. Lowe,

Offg. Assistt. Secy. to Govt., North-Western Provinces.

Mr. H. Blanford read a paper on the Cretaceous rocks of Southern India.

The Officiating Librarian submitted a report of the additions made to the Library during the months of September and October last.

Library.

The Library has received the following accessions during the months of September and October, 1858.

Presented.

Catalogue of the Government Central Museum, Madras, 4 Parts.—By the Madras Government.

Appendix to the Report on the Government Central Museum, Madras, 8vo., Madras, 1855.—By the Same.

The White Yajur Veda, Part 3, Nos. 4 and 5.—By Albrecht Weber, Berlin.

The Oriental Christian Spectator, Nos. 8 and 9, for August and September 1858.—By the Editor.

Indische Alterthumskunde for 1857-58.—By Charles Lassen.

Abhandlungen für die Kunde des Morgenlandes, Band I, No. 3, 2 copies.—By the Royal Academy of Sciences, Berlin.

The Oriental Baptist for September.—By the Editor.

The Calcutta Christian Observer for September.—By the Editors.

Reports on the Harbour of Beitkul in Sedishaghur Bay, by Col. Cotton and Lieut. Taylor.—By the Madras Government.

Reports on the direct and indirect effects of the Godavery Annicut in Rajahmundry, and the Coleroon Annicut in Tanjore.—By the Same.

Selections No. 2, from the Public Correspondence, &c. of the British Indian Association.—By the Society.

The Annals of Indian Administration, edited by Meredith Townsend.—By the Home Government.

Selections from the Records of the Madras Govt., No. 2 of 1854, No. 39, and No. 45 of 1856, 2 copies and No. 49 of 1858.—By the Madras Government.

The Oriental Baptist for October.—By the Editor.

The Quarterly Review, Vols. 50-51-52.—By Babu Gourdoss Bysack.

Memoirs of the American Academy of Arts and Sciences, Vol. V. Part 2, and Vol. VI. Part 1.—By the American Academy.

General Report on the Administration of British India. and

Maps on the Administration Report.—By the Home Government.

Proceedings of the Royal Geographical Society of London, Vol. II. No. 3.—By the Society.

Journal of the Royal Geographical Society, Vol. XXVII.—By the Society.

Photographic Drawings of the Gol Goomuz at Beejapore.—From the Hon'ble the Court of Directors through the Govt. of Bengal.

Proceedings of the Academy of Natural Sciences of Philadelphia.—By the Academy.

The Calcutta Christian Observer for October, 1858.—By the Editors.

Catalogues of the Government Central Museum in Madras, British Shells, 1. Iron Ores, 1. Palaeontology, 1. Descriptive Geology, 1. Mineralogy, 1. Five Pamphlets.—By the Madras Government.

Catalogue of Books in the Library of the Government Central Museum, Madras.—By the Same.

Reports on the Government Central Museum, Madras, and on the Government Museums at Bellary, &c. Iron Ores, Manufacture of Iron and Steel and the Coals, 1. Report for 1853.—By the Same.

Report on the Woods of Madras, 1.—By the Same.

Thirty-fifth Annual Report of the Royal Asiatic Society of Great Britain and Ireland for 1858.—By the Society.

Notice of Mr. Hugh Miller, Philadelphia, 1857.—By the American. Philosophical Society.

Le Tresor des Belles Paroles, Choix de Sentences.—Tradutes Par. P. E. Foncaux.

Bibidhartha Sangraha for Joysto.—By Babu Rajendralal Mittra.

Bijdragen Tot de Taal land-en Volkenkunde van Nedarlandsh Indie, No. 2, New Series, 8vo.—By the Royal Society of Sciences, Netherlands.

The Precepts of Jesus, &c. compiled by the late Rajah Rammohun Roy

by the Unitarian Society for the Propagation of the Gospel in India.—By Babu Rajendralal Mittra.

Twentieth Report of the Proceedings of the Calcutta School-Book Society for 1857.—By the Society.

Kitáb Jozabi, or Persian Work on the Diseases of Persia, by Dr. Pollock.—By the Govt. of India, Foreign Department.

Catalogue of Birds in the Museum of the East India Company, Vol. II. —By the Hon'ble the Court of Directors.

Pudmini Vopakhayan A Tale of Rajasthan in Bengali.—By Rungolal Banerjee.

Voyages d'Ibn Batoutah, Par. M. M. Defremery et Sanguinetti, Tome 4.—By the Asiatic Society of Paris.

Reports on the Districts of Midnapore and Cuttack, by H. Ricketts.—By the Bengal Government.

Calcutta Review for September, 1858.—By the Editors.

Journal Asiatique, Tome XI. No. 43, April and May, 1858.—By the Asiatic Society of Paris.

Zeitschrift der Deutschen Morgen: Gesellschaft, Band XII. Heft 2, *Liepzig*, 1858.—By the German Oriental Society.

Purchased.

Comptes Rendus, Nos. 23 and 24 of Tomė 46, and Nos. 2, 3, 4 and 5 of Tome 47, 1858.

Literary Gazette, Nos. 2161 and 2162, Old Series, and Nos. 1, 2, 3 and 4 of 1858, New Series.

Vendidad Sade, Part 4.

Sanskrit and English Dictionary, Improved from Professor Wilson, by Theodore Goldstücker, Vol. I. Parts 1 and 2.

Revue et Magasin de Zoologie, by Mr. F. E. Guerin-Meneville, Nos. 5 and 6 of 1858.

The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science, Supplement of No. 103, and Nos. 104 and 105 for 1858.

Notices et Extracts des Manuscrits de la Bibliotheque du Roi, Tome 16, P. 2.

Analectes sur l'Histoire et la Litterature des Arabes D'Espagne, par. Al-Makarri. Published By M. Reinhart Dozy.

Mutanubbi Carmina cum Commentario Wahidii, Edited by Fr. Dieterice, Part 1.

L Algebre D'Omar Alkhayyami.—By F. Woepcke.

Kitab-i-Yamini, translated by the Rev. James Reynolds.

Chronique de Matthieu D'Edesse, Par. E. Dulaurier.

Ibn Abd el Hakem's History of the Conquest of Spain.—By J. H. Jones.

Bibliotheca Egyptiaca.—By Dr. H. Jolowiez.

Map of Mont Rosa, shewing the Heights of its Peaks.

American Journal of Arts and Sciences for July, 1858.

Athenæum for June, 1858.

Annals and Magazine of Natural History for July, 1858, No. 7.

Annales des Sciences Naturelles, Vol. VIII. No. 2, Botanique and Nos. 4 and 5, Zoologie.

Deutsches Wörterbuch von. Jacobb Griciem und. Wilhelm Griciem, Vol. II. Part 7.

Journal des Savants for June, 1858.

Natural History Review for July, 1858, No. 3.

Revieu des Deux Mondes, for 15th June and 1st July, 1858.

Westminster Review, No. 27 for July, 1858.

Bhobanyprosad Dutt.

JOURNAL
OF THE
ASIATIC SOCIETY.

No. V. 1858.

Comparative Vocabulary of the Languages of the broken Tribes of Nepál.—By B. H. Hodgson, *Esq., B. C. S.*

(Continued from vol. xxvi. p. 522.*)*

Declension of Báhing Pronouns and of Nouns.

I.—*Of Pronouns.*

1*st Personal Pronoun.*

1. Nom. I, Go.
2. Gen. Of me { Conjunct. Wa = my. { Disjunct. Wake = mine.
3. { Dat. Ac. { To me, Me, } Go. No sign.
4. Loc. { In me, Within me. } Wake gwáre (interior).
5. Loc. { Into me, In me, { Wake di (entering, resting in).
6. Abl. From me, Wake ding (removal).
7. All. Towards me, Wake la (nearing).
8. —— From towards me, Wake lang (departing).
9. —— Towards me, Wake taure (behaving).
10. Soc. With me, { Wakenung Gonung } (society).
11. Priv. Without me, { Wake manthi Gomanthi { (privation).
12. Inst. By me, Go mi.
13. Loc. At, by me, Wa pumdi* (proximity. H. pás).

Dual.

1. Gósi, incl. Gósúkú, excl.
2. { Conjunct. Ísi, incl. Wási, excl. { Disjunct. Ísike, incl. Wásike, excl.
3. Gósi, incl. Gósúkú, excl.

* See remark in sequel. Taure, gwáre and púm, as substantives or quasi such, naturally take the genitival pronoun; and perhaps also la and lang = taraf and tarafse: but not so mi, di and ding which seem to be sheer case signs.

4. Ísikegwáre, incl. Wásikegwáre, excl.
5. Ísike di, incl. Wásike di, excl.
6. Ísike ding, incl. Wásike ding, excl.
7. Ísike la, incl. Wásike la, excl.
8. Ísike lang, incl. Wásike lang, excl.
9. Gosi taure, incl. Gosuku taure, excl.
10. Gosi nung, incl. Gosuku nung, excl.
11. Gosi manthi, incl. Gosuku manthi, excl.
12. Gosi mi, incl. Gosuku mi, excl.
13. { Isi- / Wasi- } pumdi, { incl. / excl.

Plural.

1. Gó-i, incl. Góku, excl.
2. { Conjunct. Ike, incl. Wake, excl. } { Disjunct. Ikke, incl. Wakke, excl. }
3. Gó-i, incl. Goku, excl.
4. Íkegwáre, incl. Wakegwáre, excl.
5. Íke di, incl. Wake di, excl.
6. Íke ding, incl. Wake ding, excl.
7. Íke lá, incl. Wake lá, excl.
8. Íke lang, incl. Wáke lang, excl.
9. Íke taure, incl. Wake taure, excl.
10. Góï nung, incl. Goku nung, excl.
11. Góï manthi, incl. Goku manthi, excl.
12. Goï mi, incl. Goku mi, excl.
13. { Ike- / Wake- } pumdi, { incl. / excl.

2nd Pronoun.

1. Ga.
2. { Conjunct. Í. } { Disjunct. Íke. }
3. Gá. No sign.
4. Íke gwáre.
5. Íke di.
6. Ike ding.
7. Ike la.
8. Ike lang.
9. Íke taure.
10. Ga nung.
11. Ga manthi.
12. Ga mi.
13. Í pumdi.

Dual.

1. Gasi.
2. { Conjunct. Ísi. } { Disjunct. Isike. }
3. Gasi. No sign.
4. Ísi gwáre or Ísike gwáre.
5. Ísike di.
6. Ísike ding.
7. Ísike la.
8. Ísike lang.
9. Ísi taure or Ísike taure.
10. Gasi nung.
11. Gasi manthi.
12. Gasi mi.
13. Ísi pumdi.

Plural.

1. Gani.
2. { Conjunct. Íni. } { Disjunct. Ínike. }
3. Gani. No sign.
4. Íni Gwáre.
5. Ínike di.
6. Ínike ding.
7. Ínike la.
8. Ínike lang.
9. Íni taure.
10. Gani nung.
11. Gani manthi.
12. Gani mi.
13. Íni pumdi.

3rd Personal.

1. Harem (all genders).
2. { Conjunct. Á. Haremke, common. } { Disjunct. Áke. }
3. Harem. No sign.
4. { Ágwáre or Ákegwáre. / Haremke gwáre. }
5. Ákedi. Haremdi.
6. { Ákeding. / Haremke ding. }

7. { Áke la. / Haremke la.
8. { Áke lang. / Haremke lang.
9. { Áke taure, / Haremke taure.
10. Harem nung.
11. Harem manthi.
12. Harem mi.
13. Ápumdi. Haremke pumdi.

Dual.

1. Harem dausi.
2. { Conjunct. Ási. / Disjunct. Ásike. / Harem dausike, common.
3. Harem dausi. No sign.
4. { Ási gwáre or Ásike gwáre. / Harem dausike gwáre.
5. Ásike di. Harem dausike di.
6. Ásike ding. Harem dausike ding.
7. Ásike la. Harem dausike la.
8. Ásike lang. Harem dausike lang.
9. Ási taure. Harem dausike taure.
10. Harem dausi nung.
11. Harem dausi manthi.
12. Harem dausi mi.
13. { Ási pumdi. / Harem dausike pumdi.

Plural.

1. Harem dau.
2. { Conjunct. Ani. / Disjunct. Anike. / Harem dauke, common.
3. Harem dau. No sign.
4. { Ani gware. Anike gware. / Harem dauke gware.
5. Anike di. Harem dauke di.
6. Ánike ding. Harem dauke ding.
7. Anike la. Harem dauke la.
8. Anike lang. Harem dauke lang.
9. Ánike taure. Harem dauke taure.
10. Harem dau nung.
11. Harem dau manthi.
12. Harem dau mi.
13. { Ani pumdi. / Harem dauke pumdi.

Near demonstrative. This

1. Yam* (all genders).
2. { Conjunct Yamke. / Disjunct. Yamke meke.
3. Yam. No sign.
4. Yamke gware or Yam gware.
5. Yam di.
6. Yam ding.
7. Yamke la. Yam la.
8. Yamke lang. Yam lang.
9. Yamke taure. Yam taure.
10. Yam nung.
11. Yam mauthi.
12. Yam mi.
13. Yamke pumdi.

Dual.

1. Yam dausi.
2. { Yam dausike. / Conj. and Disj.
3. Yam dausi. No sign.
4. Yam dausike gware.
5. Yam dausi di.
6. Yam dausi ding.
7. Yam dausike la.
8. Yam dausike lang.
9. Yam dausike taure.
10. Yam dausi nung.
11. Yam dausi manthi.
12. Yam dausi mi.
13. Yam dausike pumdi.

Plural.

1. Yam dau.
2. { Yam dauke. / Conj. and disj.
3. Yam dau. No sign.
4. { Yam dau gware. / Yam dauke gware.
5. Yam dau di.
6. Yam dau ding.
7. Yam dau (ke) la.
8. Yam dau (ke) lang.
9. Yam dauke taure.
10. Yam dau nung.
11. Yam dau manthi.
12. Yam dau mi.
13. Yam dauke pumdi.

Remote Demonstrative.

1. Myam† (all genders).
2. { Myamke, conj. / Myamk meke, disj.
4. Myam. No sign.
4. Myamke gwáre.
5. Myam di.
6. Myam ding.
7. Myamke la.
8. Myamke lang.

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* Yam or yem and so Myam or myem. All vowel sounds are extremely vague. G-yem, the relative, is evidently a derivative of yem.

† Myam or Myem.

9. Myamke taure.
10. Myam nung.
11. Myam manthi.
12. Myam mi.
13. Myamke pumdi.

Dual.

1. Myam dausi.
2. { Myam dausike. / Conj. and disj. &c. like singular. }

Plural.

1. Myam dau.
2. { Myam dauke. / Conj. and disj. &c. ut supra. }

Interrogative and Distributive.

Who? What person? Any one: m. and f. Substantival and adjectival.*

1. Sú.
2. { Suke. / Conj. and disj. or / Sukemeke, disj. }
3. Su. No sign.
4. Su gware.
5. Su di.
6. Su ding.
7. Sula. Sukela.
8. Su lang. Suke lang.
9. Su taure. Suke taure.
10. Su nung.
11. Su manthi.
12. Su mi.
13. { Su á pumdi. / Suke pumdi. }

Dual.

1. Su dausi.
2. Su dausike, &c.

Plural.

1. Su dau.
2. Su dauke, &c.

Interrogative and Distributive Neuter.

What? What thing? Any thing:† Substantival and adjectival.

1. Mára.
2. Márake, &c.

Dual.

1. Mára dausi.
2. Mára dausike, &c.

Plural.

1. Mára dau.
2. Mára dauke, &c.

Relative of all genders.

He, she, who; that, which: substantival and adjectival.‡

1. Gyem.
2. Gyemke.

Dual.

1. Gyem dausi.
2. Gyem dausike, &c.

Plural.

1. Gyem dau.
2. Gyem dauke.

Reflective. Self.

1. Daubo or Dwábo.
2. Dwábo ke.
3. Dwábo. No sign.
4. Dwábo gware.
5. Dwábo di.
6. Dwábo ding.
7. Dwábo la.
8. Dwábo lang.
9. Dwábo taure.
10. Dwábo nung.
11. Dwábo manthi.
12. Dwábo mi.
13. Dwábo pumdi.

Dual and plural as before.

So also are declined Hwappe or Hauppe = all and every; Gisko = how many; and as many; Metti = so many; Dhé kono = many and much; Dékho = a few, a little; Gisko = whoever and whatever; Kwángnáme = other, another; Myem = the same (see *that*); Nimpho = both; and in a word, all primitive or personal pronouns. Possessive pronouns are formed from the genitives, except in the case of the 3 leading pronouns. I, thou, he or she or it, each of these has two distinct forms quite separate from the personals—thus go has wá = mei and meus, in English, of me and my; and wake = English mine. So also ga, the 2nd pronoun has í and íke, and harem the 3rd has á and áke. The first of these two possessive or genitival forms are pronominal adjectives or rather adjuncts of nouns and verbs (and adverbs also) by prefix and suffix respectively. The second are pronouns pro-

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* Equal kon and kói. Hindi and Urdu.

† Equal kya and kuech.

‡ Equal jón and jó. The correlative is Myam = Tón and Tó. It is rarely used because of the relative character of the participles.

per, like mine, thine, in English.* The former are indeclinable: the latter, are declinable, like all other proper possessives, though with some confusion originating in the imperfect development of the inflective element, its frequent coincidence with the genitive sign, and the variableness of that sign.

However, the case signs generally and their mode of annexation being uniform, out of this essentially one declension order is obtained, despite the disturbing causes adverted to. I give here as a sample of the possessives.

Dauboke = own.

1. Dauboke.
2. { Caret? / Dwabokeke.†
3. Dauboke.
4. Dauboke gware.
5. Dauboke di.
6. Dauboke ding.
7. Dauboke la.
8. Dauboke lang.
9. Dauboke taure.
10. Dauboke nung.
11. Dauboke manthi.
12. Dauboke mi.
13. { Dauboke pumdi or Daubo á pumdi.

Daubo = áp; dauboke = apna. *Apnaka* can only be separately expressed by the cacophonous iteration of the guttural. Nor is this defect remedied by the use of the conjunct pronouns, wá, í, á; for wadwábo myself gives wádwáboke, of myself and my own; and ídwábo, thyself gives ídwáboke of thyself or thy own. See more on the genitive in the sequel.

II.—*Declension of Nouns.*

1st.—*Substantives proper.*

Wainsa, a man, m.

1. Wainsa.
2. { Wainsake, disjunct, or / Wsinsa á, conjunct.
3. Wainsa. No sign.
4. { Wainsa gware or / Wainsa á gwáre.
5. Wainsa di.
6. Wainsa ding.
7. Wainsa la.
8. Wainsa lang.
9. Wainsa á taure.
10. Wainsa nung.
11. Wainsa manthi.
12. Wainsa mi.
13. Wainsa á pumdi.

Dual.

1. Wainsa dausi.
2. { Wainsa dausike, disjunct. / Wainsa ási, conjunct.
3. Wainsa dausi.
4. { Wainsa dausike gwáre. / Wainsa dausi ási gware.
5. Wainsa dausi di.
6. Wainsa dausi ding.
7. Wainsa dausi la.
8. Wainsa dausi lang.
9. { Wainsa dausike taure. / Wainsa dausi ási taure.
10. Wainsa dausi nung.
11. Wainsa dausi manthi.
12. Wainsa dausi mi.
13. Wainsa dausi ási pumdi.

Plural.

1. Wainsa dau.
2. { Wainsa dauke, disjunct. / Wainsa dau áni,‡ conjunct.
3. Wainsa dau. No sign.

* The formation of these from the my, thy, series by the addition of "ki" or "ke" is quite Turkic. Wa = my, wá-ke = mine. So Turki Benim = my, benim-ki = mine. Only Bahing uses the conjunct form merely (quasi im, imki) of the pronoun which in that tongue moreover is a prefix, in Turki an affix, of nouns.

† Compare uskaka in Hindi and Urdu.

‡ Á, ási and áni are the conjunct forms attaching to nominative which follows genitive, thus Wainsa dau áni ming, or wainsa dauke áni ming = the wife of several men, literally men (of) their wife or woman. The use of the same form in the next case proves gwáre to be a substantive used as a preposition, like *bhitar* in Hindi: áni gware = their interior.

4. { Wainsa dauke gware.
   Wainsa dau áni gware.
5. Wainsa dau di.
6. Wainsa dau ding.
7. Wainsa dau la.
8. Wainsa dau lang.
9. { Wainsa dau ke taure or
   Wainsa dau áni taure.
10. Wainsa dau nung.
11. Wainsa dau manthi.
12. Wainsa dau mi.
13. Wainsa dau áni pumdi.

So also is declined Mincha, a woman, and ming a wife, and all feminine nouns.

Declension of a Neuter.

Substantive.

Grokso, a thing.

1. Grokso,
2. { Groksoke, disjunct.
   Grokso-á, conjunct.
3. Grokso.
4. Grokso á gware.
5. Grokso di.
6. Grokso ding.
7. Grokso la.
8. Grokso lang.
9. Grokso á taure.
10. Grokso nung.
11. Grokso manthi.
12. Grokso mi.
13. Grokso á pumdi.

Dual.

1. Grokso dausi.
2. { Grokso dausike, disjunct.
   Grokso dausi ási, conjunct.
3. Grokso dausi, &c.

Plural.

1. Grokso dau.
2. { Grokso dauke or
   Grokso dau áni, &c.

It results from the above that there is but one declension; that gender has no grammatical expression; that number, like case, is expressed by separate post-positions, number going first; that all nouns and pronouns take the signs of number, neuters as well as others; that some of the signs of case are still significant (gware the interior; taure, the top; púm, the side); that *ke* is the general genitive sign, but rarely used save when the noun stands alone, as in reply to a question, thus, whose?—the man's, is suke, wainsake; that when two substantives come together, the former is the genitive and has properly no sign (no qualitive ever has), though the "ke" be sometimes superadded to the special denotator which is á, the 3rd pronoun (his, her, its), or dim whose sense is, in of. Dim expresses a relation of locality or inness (what is contained); á, almost all other sorts of relation. Dim is used conjunctively and disjunctively, as, of where the tooth? gyelame khleu: of the mouth, sheödim. Both precede the second substantive or nominative—thus wainsa á ning = the man's name; grokso á syanda = the thing's sound; rú dim khán = vegetables of the garden; bazar dim shéri = bazar rice or rice of the bazar; pu dim pwáku, water of the cup, so that this latter may be called the general way of expressing the relation of two substantives which are both named—the former the general way of expressing relation when the qualitive noun only is named, for genitives are all qualitives, e. g. singke = wooden; ramke = bodily; lastly, that pronouns and nouns are declined throughout and in all respects in the same way; there being no difference whatever between them. As to the genitive relation it should be further noted that the first of two substantives is by position alone a genitive; that very close connexion and dependance is expressed by á, e. g, the calf of the cow, gai á támi; that "ke" can be used with á, as wainsake á ning, the man's his name; that where ke is formative, as singke, = wooden, from sing, wood, its conjunctive use is indispensable like that of the ba and na, the participial formatives; thus syelke bétho, the iron blade;* neubá muryu, the or a good man (properly, the man who is good) from syel = iron (subs.) and neu, to be good. Observe further that the topical sign di, both asks and answers, as, ru dim khan, garden vegetables; and, of where? the garden's gyélam (or gyélame), rúdim.

In this latter instance we may observe

* Observe that the iron of the blade is bétho á syel or betho ke syel. But the point or haft of the blade is necessarily bétho á juju and betho á rising.

that, gyéla being where, the final m or me of gyélam, gyélame, has, in respect of adverbs, a genitival force and so in di-m, of in; and in qualitives we constantly find a similar termination (bubum = white; lalam = red; Kwágname = other &c.), so that the m final is shown to be generally possessive; and more especially as its iteration (bubumme = the white one; lala-mme = the red one; kwag-namme = the other one) expresses the disjunct form of the same relation. Thus, which one will you have? the red one or the green, Agyeme blávi, lalamme ki gigimme, a sample wherein the possessive á is welded to the relative pronoun, gyem. By turning to the participles it will be seen that all those which have not a sign of their own (ba or na) are made participles by the annexation of the m or me particle. This is in fact the general attributive affix, and its suffixture transforms all qualitives (including adverbs) into substantives or words used substantivally, like the hma gu affix of Newari and like also the Dravirian van, val, which seem to me to be the unquestionable prototypes of the Prakritic, wan, wal, war, (Gaon-wár, Sheto-wala, Gári wán. Marne wala, &c.) I subjoin a few comparative samples drawn from Bahing and Newári, which will also show that nearly any word in these tongues can be used substantivally, and that all qualitives, in particular, can by the appropriate affix be made substantival, e. g. singke, wooden; singkeme, the wooden one.

English.	Bahing.	Newári.	Hindi.
1. The one	Kwong-me, m. n. Kwong nimame, f.	1. Chha-hma, m. f. Chha-gu, n.	1. Caret.
2. Mine or my one	Wake-me, m. n. Wake nimame, f.	2. Ji-hma, m. f. Ji-gu, n.	2. Mera wala, m. n. Meri wali, f.
3. The black	Kyakya-me, m. n. Kyakya nimame, f.	3. Hyáku-hma, m. f. Hyaku-gu, n.	3. Kala wala, m. n. Kali wali, f.
4. The striker. The striking one or one that strikes	Teupba-me, m. f. Teupba nimame, f. Teupcho-me, n.	4. Da-hma, m. f. Da-gu, n.	4. Kutne wala, m. n. Kutne wali, f.
5. The wooden one	Singke-me, m. n. Singke nimame, f.	5. Sínya-hma, m. f. Sínya-gu, n.	5. Kath wala, m. n. Kath wali, f.
6. The anterior one	Gnalla-me, m. n. Gnalla nimame, f.	6. Nhápaya-hma, m. f. Nhápaya-gu, n.	6. Áge wala, m. n. Áge wali, f.
7. The posterior one	Notha-me, m. n. Notha nimame, f.	7. Lipaya-hma, m. f. Lipaya-gu, n.	7. Píche wala, m. n. Píche wali, f.
8. The here one	Eke-me, m. n. Eke nimame, f.	8. Thanaya-hma, m. f. Thanaya-gu, n.	8. Íhan wala, m. n. Íhan wáli, f.
9. The there one	Meke-me, m. n. Meke nimame, f.	9. Ánaya-hma, m. f. Ánaya-gu, n.	9. Úhan wala, m. n. Úhan wali, f.
10. The to-day's one	Ána-me, m. n. Ána nimame, f.	10. Thá wúnya-hma, m. f. Thá wúnya-gu, n.	10. Áj wala, m. n. Áj wali, f.
11. The comer, the coming one	Píba-me, m. n. Píba nimame, f.	11. Wó-hma, m. f. Wo-gu, n.	11. Áne wala, m. n. Áne wali, f.
12. The manlike one	Wainsákho-me, m. n. Wainsakho nimame, f.	12. Mijangsu-hma, m. f. Mijangsu-gu. n.	12. Mardsa wala, m. Mardsa wali, f.
13. The masculine one	Wainsake-me, m. n. Wainsake nimame, f.	13. Mijangya-hma, m. f. Mijangya-gu, n.	13. Mardana wala, m. Mardana wali, f.
14. The lowland (being) one	Dheptecha-me, m. n. Dheptecha nimame, f.	14. Kobiya-hma, m. f. Kobiya-gu, n.	14. Madhes wala, m. n. Madhes wali, f.
15. Ths highland (being) one	Syertecha-me, m. n. Syertecha nimame, f.	15. Choya-hma, m. f. Choya-gu, n.	15. Parbat wala, m. n. Parbat wali, f.

English.	Báhing.	Newári.	Hindi.
16. The handsome one	Rimba-me, m. n. Rimba nimame, f. or Rimsokpa.me, m. Rimsongma-me, f.	16. Bangla-hma, m. f. Bangla-gu, n.	16. Sunder wala, m. Sunder wali, f.
17. The young one	Bebacha-me, m. Bebacha nimame, f.	17. Mochacha-hma. Mochacha gu.	17. Chota wala, m. n. Choti wali, f.
18. The adult one	Swalocha-me, m. Swalomi-me, f.	18. Lyáyehma-hma, m. Lyásehma, f.	18. Siyán wala, m. Siyán wali, f.
19. The old one	Gnáwáme, m. Gnámi-me, f.	19. Jyatha-hma, m. Jyíthi-hma, f.	19. Budha wala. Budhi wali, f.
20. The Tibetan one (being)	Leucha-me, m. Leucha nimame, f.	20. Sanya-hma, m. f.	20. Bhot wala, m. n. Bhot wali, f.
21. Tibetan one (thing)	Leucha dyaldim-me, n.	21. Sanya-gu, n.	21. Bhotka wala.
22. The household one The domestic one	Khyimcha-me, m. Khyimcha nimame, f.	22. Chhenya-hma, m. f. Chhenya-gu, n.	22. Gharwala, m. n. Ghar wali, f.
23. The wild one	Sabalacha-me, m. n. Sabalacha nimame, f.	23. Gunya-hma, m. f. Gunya-gu, n.	23. Jangal wala, m. Jangal wali, f.
24. The good one	Neuba-me, m. n. Neuba-nimame, f.	24. Bhing-hma, m. f. Bhing-gu, n.	24. Achha wala, m. n. Acchi wali, f.
25. The white one	Bubu jokpa-me, m. Bubu jongma-me, f. or Bubum-me, m. n. Bubum nimame, f.	25. Toyu-hma, m. f. Toyu-gu, n.	25. Shéto wala, m. n. Shéti wali, f.
26. The bowman's	Líchake-me, m. Lícha nimakeme, f.	26. Lipajonghmaya-hma, m. f. Lipajonghmaya-gu, n.	26. Dhanuk walaka, m. Dhanuk walika, f.
27. The son-in-law's The daughter-in-law's	Dyel chake-me, m. Dyel mikeme, f.	27. Jichaya-hma, m. f. Jichaya-gu, n. Bohumochaya-hma, m. f. Bohumochaya-gu, n.	27. Dámád wala, m. Dámád wali, f. Patho wala, m. Patho wali, f.

3 G

Remark.—The above list affords, it will be seen, collateral information as to the formation of gender in qualitives used substantivally. It also shows that the formative suffix cha is apt to be equivalent for the suffix, me, m; and as cha still leaves a substantival word (e. g. Khyim-cha = householder; Lí-cha = bowman) the genitival sign ke is often introduced before final me, to express possessiveness, as, whose bow is that? the bowman's, suke lí, líchakeme. But Lícha being bowman, líchame may be used for bowman's. Newári avoids all vagueness by its hma and gu signs, repeated to ties quoties with the genitive sign ya, e. g. Ji-hma, mine, m. and f. Ji-gu, mine, n. Ji hma ya hma, Ji hma ya gu, Ji hma ya hma ya, Ji hma ya gu ya, Ji gu ya hma ya, Ji gu ya gu ya, &c. express any number of variations in the possession of beings and things: and so also in all qualitives used substantivally, thus, toyu hma ya hma, the white man's animal, toyu hma ya gu, the white man's thing, toyu hma ya gu ya, of the white man's thing, &c. Compare Bahing khyim-cha-me with Newári Chhen-ya-hma and it will be seen that cha = ya has a quasi adjectival force though khyimcha mean house-holder. Such vagueness is normal.

Classification of Bahing Verbs.

I.—Transitives in "wo." Infinitive Bla-cho, to take. Imperative blawo, take it.

Indicative active, Sing. number. Present.	*Preterite.*	*Indicative passive, Sing. number. Present.*	*Preterite.*	*Causal imperative.*
1. Bla-gna.	1. Blaptong.	1. Blayi (i).	1. Blati.	Bla-páto, tr.
2. Blayi (i).	2. Blapteu.	2. Blaye (e).	2. Blate.	Bla paso, r.
3. Blawa.	3. Blapta.	3. Blawa.	3. Blata.	Bla-payi, p.*

Thus are conjugated Méwo, to vomit. Cheuwo, to grill. Gíwo, to give. Séwo, to saw. Chwéwo, to burn corpse Biáwo, to scatter. Táwo, to get or find. Jáwo and Báwo, to eat. Khí-wo, to quarrel with. Kú-wo, to steal. Kíwo, to cook. Pá-wo, to do. Leu-wo, to kiss (coitus). Sí-wo, to seize. Té-wo, to spit on. Mó-wo, to fight. Wódipa-wo, to assay and all compounds of like kind, i. e. of a noun and the verb to do or make.

Intransitives in "wo." Infinitive Pícho, to come. Imperative Pí-wo, come.

1. Pí-gná.	Pí-ti.	"	"	Pí-pato, tr.
2. Pi-yé (e).	Pí-té.	"	"	Pí-paso, ref.
3. Pí.	Pí-tá.	"	"	Pí-payi, pas.

Thus are conjugated Rá-wo, to come. Glewo, to be hot. Hó-wo, to be lighted. Ká-wo, to be bitter. Lá-wo and Dí-wo, to go. Kú-wo, to come up (slope). Yú-wo, to come down (slope). Khí-wo, to tremble. Neu-wo, to be good. Deu-wo, to be reconciled. Shéo-wo, to decrease or decay. Syé neuwo, to be fat. Bhlú-wo, to slip or slide down. Shú-wo, to itch. Jí-wo, to be ripe, &c.

II.—Transitives in "gno." Infinitive Kwó-cho, to see. Imperative Kwógno, see it.

1. Kwó-gnú.	Kwó-tóng.	1. Kwó-yí (í).	Kwó-tí.	Kwó-pa-to, tr.
2. Kwó-gní.	Kwó-t-éu.	2. Kwó-gné (ê).	Kwó-té.	Kwó-pa-so refl. or middle.
3. Kwó.	Kwó-tá.	3. Kwó.		Kwó-ta.	Kwó-pa-yi, pas.

* The causal forms are the same throughout; pato, following the mutable transitives in "to;" paso, all intransitives whatever in "so;" and páyi (pá-í) all possessives in í. yí for euphony.

This classification rests on the Indicative singular. The infinitive and imperative and causal are given chiefly as clues to the root and to the euphonic changes. The form of the classification is throughout the same, 1, 2, 3 refer to the three persons.

Thus are conjugated só-gno, to tell. Lé-gno, to sell. Tú-gno, to drink (water). Chó-gno, to cultivate and to pay debt. Phlí-gno, to send, &c.

Intransitives in "gno." Infinitive, Glwau-cho, to win. Imperative, Glwau-gno, win.

Indicative active, sing. number. Present.	Preterite.	*Indicative passive, sing. number.* Present.	Preterite.	*Causal.* Imperative.
1. Glwau-gna.	Glwau-ti.	„	„	Glwau-pa-to, tr.
2. Glwau-gne.	Glwau-te.	„	„	Glwau-pa-so, refl.
3. Glwau.	Glwau-tá.	„	„	Glwau-pa-yi, pas.

Thus are conjugated Rú-gno, to be filled (belly) or satisfied. Lé-gno, to return, Wo-gno, to enter. Glú-gno, to issue. Ming-gno, to be ripe. Bro-gno, to be flavoursome.

III.—Transitives in "ko." Infinitive, Pok-cho, to make get up, or raise (not lift). Imperative, Pokko, raise him.

1. Pó-gú.	Pók-tóng.	1. Póng-yi ? (í).	Pók-ti.	Pong-pato.	ut supra.
2. Pó-gí.	Pók-teu.	2. Pong-ye. Pó-nyé.	Pók-te.	Pong-paso.	
3. Pó-gá.	Pók-ta.	3. Pó-gá.	Pók-ta.	Pong-payi.	

Thus are conjugated Tuk-ko, to lick. Chuk-ko, to bind. Rik-ko, to reap. Kik-ko, to beget. Hik-ko, to count. Kú-ko, to crooken. Yok-ko, to share out. Prwak-ko, to unknot. Nok-ko, to rub. Tok-kon, to make fall. Hok-ko, to open. Jik-ko, to break. Pwak-ko vel Pukko, to burst. Ryak-ko, to write or colour. Jak-ko, to know. Khryak-ko, to enrage and to revile. Rik-ko, to reap. Kok-ko, to dig. Ruk-ko, to eradicate. Tyak-ko, to hinder. Wok-ko, to flay. Khlyak-ko, to plaster. Phwak-ko, to separate. Chyak-ko, to divide. Pik-ko, to pour or put in. Dwak-ko, to swallow.

N. B.—The double k is doubtful.

Intransitives in "ko." Infinitive, Bok-cho, to get up. Imperative, Bok-ko, get up.

1. Bóng-gna.	Bók-ti.	„	„	Bong-pa-to	ut supra.
2. Bóng-gne, nye.	Bók-te.	„	„	Bong-pa-so	
3. Bóng.	Bók-ta.	„	„	Bong-pa-yi	

Thus are conjugated Gruk-ko, to be quick. Jwak-ko, to arrive. Jik-ko, to be broken, (n and a). Buk-ko, to be burst. Bwak-ko, to remain and to speak. Gú-ko, to be crooked. Phok-ko, to be sour. Gwak-ko, to walk. Duk-ko, to move or shake. Prok-ko, to jump, or leap. Byak-ko, to die. Gik-ko, to be born. Gnwak-ko, to weep. Dwak-ko, to desire, Dok-ko, to fall from aloft (being only). Here again the double k is doubtful, e. g. Dóko or Dokko : et sic decœt.

IV.—Transitives in "ro." Infinitive, Phyér-cho, to sew. Imperative, Phér-ro, sew it.

1. Phyér-ú.	Phyér-tong.	1. Phyér-yi (i).	Phyér-ti.	Phyér-pato	ut supra.
2. Phyér-i.	Phyér-t-eu.	2. Phyér-e.	Phyér-te.	Phyér-paso	
8. Phyér.	Phyér-ta.	3. Phyér.	Phyér-ta.	Phyer-payi	

Thus are conjugated Chwarro, to cut. Kurro, to carry. Tyarro, to suffer, endure. Khwarro, to shave or scrape or scratch (violently). N. B.—Iterate final "r" is doubtful.

Intransitives in "ro." Infinitive, Byar-cho, to fly. Imperative, Byarro, fly.

1. Byar-gná.	Byar-t-i.	„	„	Byar-pato	ut supra.
2. Byar-é.	Byar-t-e.	„	„	Byar-paso	
3. Byar.	Byar-t-a.	„	„	Byar-payi	

Thus are conjugated Bárro, to increase. Chyárro, to shine, as sun, &c.

V.—Transitives in "lo." Infinitive, Jyul-cho, to place. Imperative, Jyullo, place it.

Indicative active, sing. number.		*Indicative passive, sing. number.*		*Causal.*
Present.	*Preterite.*	*Present.*	*Preterite.*	*Imperative.*
1. Jyul-u.	Jyul-tong.	1. Jyul-yi.	Jyul-ti.	Jyul-pato } ut supra.
2. Jyul-i.	Jyul-teu.	2. Jyul-e.	Jyul-te.	Jyul-paso
3. Jyul.	Jyul-ta.	3. Jyul.	Jyul-ta.	Jyul-payi

Thus are conjugated Syallo, to snatch away. Theullo, to cherish. Yallo, to rub. Limo challo, to tell lies. N. B.—The iterate final consonant again doubtful.

Intransitives in "lo." Infinitive, Bál-cho, to be tired. Imperative, Bállo, be tired.

1. Bál-gna.	Bál-ti.	"	"	Bál-pato } ut supra.
2. Bál-e.	Bál-te.	"	"	Bál-paso
3. Bál.	Bál-ta.	"	"	Bál-payi

Thus are conjugated Hyállo, to be heavy, &c.

VI.—Transitives in "po." Infinitive, Teup-cho, to beat. Imperative, Teuppo, beat him.

1. Teub-u.	Teup-tong.	1. Teum-yi (i).	Teup-ti.	Teum-pato } ut supra.
2. Teub-i.	Teup-teu.	2. Teum-é.	Teup-te.	Teum-paso
3. Teub-a.	Teup-ta.	3. Teub-á.	Teup-ta.	Teum-payi

Thus are conjugated Gup-po, to lift (a light thing). Bippo, to suck. Syappo, to wash and sharpen. Khuppo, to collect. Jyappo, to buy. Thappo, to weigh. Chappo, to can it, to be able for any work. Nippo, to express. Appo, to shoot. N. B.—The iterate consonant doubtful.

Intransitives in "po." Infinitive Rap-cho, to stand. Imperative, Rappo, stand up.

1. Ram-gna.	Rap-ti.	"	"	Ram-pato } ut supra.
2. Ram-é.	Rap-te.	"	"	Ram-paso
3. Ram.	Rap-ta.	"	"	Ram-payi

Thus are conjugated Ippo, to sleep. Ryippo, to be ended or to end, n. Dhappo, to shine as sun. Deuppo, to be combust. Jippo, to be rotten, &c.

VII.—Transitives in "mo." Infinitive, Lam-cho, to search. Imperative, Lammo, search for it.

1. Lam-u.	Lam-tong.	1. Lam-yi (i).	Lam-ti.	Lam-pato } ut supra.
2. Lam-i.	Lam-teu,	2. Lam-e.	Lam-te.	Lam-paso
3. Lam.	Lam-ta.	3. Lam.	Lam-ta.	Lam-payi

Thus are conjugated Nam-mo, to smell. Theum-mo, to finish or cause to become. Khleummo, to transplant. Phemmo, to take in one's arms. Sheummo, to cover. Thimmo, to bury. Hammo, to spread. Here again the iterate consonant is doubtful. This conjugation agrees with IV. and V. See remark at VIII.

Intransitives in "mo." Infinitive, Dyum-cho, to become. Imperative, Dyummo, become.

1. Dyum-gna.	Dyum-ti.	"	"	Dyum-pato } ut supra.
2. Dyum-é.	Dyum-te.	"	"	Dyum-paso
3. Dyum.	Dyumta.	"	"	Dyum-payi

Thus are conjugated Rimmo, to be handsome. Dyammo, to be full. Hammo, to be light (levis). Khummo, to stoop. Ryammo, to be emaciated, or thin. N. B.—Double consonant doubtful.

VIII.—Transitives in "no." Infinitive, Pun-cho, to beg. Imperative, Pun-no, beg it.

1. Pun-u.	Pun-tong.	1. Pun-yi.	Pun-ti.	Pun-pato } ut supra.
2. Pun-i.	Pon-teu.	2. Pun-e.	Pun-te.	Pun-paso
3. Pun.	Pun-ta.	3. Pun.	Pun-ta.	Pun-payi

Thus are conjugated Ninno, to hear. Plenno, to release or set at liberty. Salepanno, to spin, &c.

N. B.—This agrees with the last. Hence IV. V. VII. VIII. are one, and it seems likely that the common imperative sign should be "o," however near that be to "wo" or the sign of the very different first conjugation. The four specified agree moreover in not being subject to any euphonic changes in conjugation. They might be unitized as transitives in a liquid or nasal.

Intransitives in "no" Infinitive, Wan-cho, to run. Imperative, Wan-no, run.

Indicative active, sing. number.		*Indicative passive, sing. number.*		*Causal*	
Present.	*Preterite,*	*Present.*	*Preterite.*	*Imperative.*	
1. Wan-gna.	Wan-ti.	,,	,,	Wan-pato	ut supra.
2. Wan-é.	Wan-te.	,,	,,	Wan-paso	
3. Wan.	Wan-ta.	,,	,,	Wan-payi	

Thus are conjugated Blenno, to live, &c. N. B.—Here as before, the doubling of the consonant is doubtful.

IX.—Transitives in "to." Infinitive Brécho, to summon. Imperative, Bré-to, summon him.

1. Brét-u.	Bréttong.	1. Brét-i.	Brétti.	Bré-pato	ut supra.
2. Brét-i.	Brétteu.	2. Brét-e.	Brétte.	Bré-paso	
3. Brét-a.	Brétta.	3. Brét-a.	Brétta.	Bre-páyi	

So are conjugated Ríto, to laugh at. Dáto, to catch. Níto, to set down. Khleuto, to conceal. Neuto, to make good. Mú-to, to blow (breath). Khúto, to touch. Grúk-to, to quicken. Bí-to, to obey. Rok-to, to lift. Dwak-to, to approve. Khryapto, to kindle. Rik-to, to contain. Gap-to, to add to. Duk-to, to shake it or cause to shake. Grepto, to throw. Dapto, to taste. Nyapto, to shove. Mimto, to remember. Bláto, to dry at fire. Jíto, to wet. Chamto, to amuse. Teuto, to know. Yokto, to remove. Le-to, to take back. Syanto, to recognise. Hanto, to cheat. Játo, to stop, detain. Khlamto, to spoil. Lwakto, to put upon. Bapto, to scratch for ease. Plepto, to fold. Timto, to squeeze. Lipto, to turn over. N. B.—Those which have a consonant before the sign, as Rok-to, Dap-to, Dwak-to, Cham-to, Han-to and Khlam-to, &c. do not double the "t" in the preterite of either voice; and consequently, in the passive, there is no mark of the distinction of time, e. g. Dapti, is I am tasted and I was tasted ;* and, again, Daptu is I taste, Daptong, I tasted, but Dapta, is he tastes or he tasted—the last, however, is a general trait.

X.—Transitives in "to" which change the "t" into "d." Infinitive, Sá-cho, to kill. Imperative, Sá-to, kill him.

1. Sád-u.	Sátong.	1. Sáyi.	Sáti.	Sá-pato	ut supra.
2. Sád-i.	Sáteu.	2. Sáne.	Sáte.	Sá-paso	
3. Sád-a.	Sáta.	3. Sada.	Sáta.	Sa-payi	

Thus are conjugated Wá-to, abandon or leave. Tá-to, to kick. Yéto, to split. Úto, to fell. Lá-to, to take away. Páto, to do for another. Krá-to, to bite. Kléö-to, to undress. Móto, to tell. Chíto, to tear. Píto, to bring. Kú-to, to bring up. Limléto, to feel. Yú-to, to bring down. Já-to, to make steady or firm. Phú-to, to sow. Náto and Préto, to gather. Phá-to, to exchange. Khrí-to, to grind. Hó-to, to pierce. Hé-to, to distil.

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* In such cases the sense is determined by the use of the separate prefixed pronouns in the instrumental and objective respectively. Difference of time by an adverb.

Intransitives in "to." Infinitive, Gní-cho, to be afraid. Imperative, Gní-to, be afraid.

Indicative active, sing. number.		*Indicative passive, sing. number.*		*Causal.*
Present.	*Preterite.*	*Present.*	*Preterite.*	*Imperative.*
1. Gní-gna.	Gní-ti.	,,	,,	Gní-pato
2. Gní-ne.	Gní-te.	,,	,,	Gní-paso } ut supra.*
3. Gní.	Gní-ta.	,,	,,	Gní-payi

So are conjugated Jí-to, to be torn. Khá-to, to be in pain. U'-to, to fall (on ground). Sheö-to, to lose. Lé-to, to return. Jyukokáto, to flee. Héto, to be sharp. Bré-to, to vociferate.

XI.—Neuters in "to." Infinitive, Bo-cho, to flower. Imperative, Bo-to, flower.

1. Bót-u.	Bótti.	,,	,,	Bó-pato
2. Bót-i.	Bótte.	,,	,,	Bó-paso } ut supra.
3. Bót-a.	Botta.	,,	,,	Bó-payi

Thus are conjugated Khíto, to blow as wind. Síto, to fruit. Wamto, to sink or set as sun. But the last gives, owing to the consonant before the sign. Wamtu, Wamti, Wamta: Wamti, Wamte, Wamta. Infinitive, wam-cho. (See Kwádo and Sódo). Sí-to is often conjugated Sidu, Sidi, Sida; Siti, Site, Sita.

XII.—Transitives in "to." Infinitive, Gram-cho, to hate. Imperative, Gram-do, hate him.

1. Gramdu.	Gramtong.	1. Gramdi.	Gramti.	Gram-pato
2. Gramdi.	Gramteu.	2. Gramde.	Gramte.	Gram-paso } ut supra.
3. Gramda.	Gramta.	3. Gramda.	Gramta.	Gram-payi

Thus are conjugated Chyurdo, to wring. Rimdo, to expect. Cháyindo or Chyéndo, to teach. Kwádo, to put on the fire. Wando, to put or pour in. Wárdo, to throw away. Plendo, to forget. Chamdo, to divert, amuse. Glundo, to extract or take out. Jyuldo, to place for another. Tundo, to cause to drink. Sódo, to tell for another. Gremdo, to roast. Heldo, to mix. But Kwádo and Sódo, having no consonant before the sign; double the t, as in IX. thus

1. Só-du.	Sóttong.	1. Só-di.	Sótti.	Só-pato.
2. Só-di.	Sótteu.	2. Só-de.	Sótte.	Só-paso.
3. Só-da	Sótta.	3. Só-da.	Sótta.	Só-payi.

N. B.—This, like Sógno of conjugation II. makes infinitive Só-cho and causal Só-pato, &c. and in fact the various modifications of the verbs by voice and in the peculiar manner here in question (so-gno, tell; so-do, tell for another) are sadly deficient in correspondent forms of the infinitive and participles. See on.

Intransitives in "do." Infinitive, Myel-cho, to be sleepy. Imperative, Myel-do, be sleepy.

1. Myeldu.	Myelti.	,,	,,	Myel-pato
2. Myeldi.	Myelte.	,,	,,	Myel-paso } ut supra.
3. Myelda.	Myelta.	,,	,,	Myel-payi

N. B.—This nearly agrees with XI. only that the root having a final consonant, the preterite "t" is not doubled. So are conjugated (I have found no other verbs of this conjugation).

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* U'to and Sheöto, like Jikko elsewhere, are both neuter and transitive. See them under the respective heads. Khíwo, to tremble is neuter; to quarrel is transitive. Bré-to, to cry out is neuter; Bré-to, to summon is active.

XIII.—Intransitives in "so." Infinitive, Nís-cho, to sit. Imperative, Niso, sit down.

Indicative active, sing. number.		*Indicative passive, sing. number.*		*Causal*	
Present.	*Preterite.*	*Present.*	*Preterite.*	*Imperative.*	
1. Nísi-gna.	Ní-s-ti.	"	"	Nísi-pato	ut supra.
2. Ní-se.	Ní-s-te.	"	"	Nísi-paso	
3. Ní-se.	Ní-s-ta.	"	"	Nísi-payi	

This conjugation interposes its reflex sign or "s," between the root and the ordinary intransitive conjugational forms. Nearly all transitives can be conjugated in this form as a middle voice. But it has also many primitives as will be seen by the instances given. So also are conjugated Wáso cacare. Chárso mingere. Píso crepitum facere. Náso, to take rest. Chyénso or Chayinso, to learn. Khleuso, to lie hid. Syínso or Shayínso, to wake. Sáso, to kill one's self. Teumso, to beat one's self. Bamso, to scratch one's self. Ríso, to laugh. Gléso, to lie down. Chíso, to bathe. Phíso, to dress. Chamso, to play. Prénso, to begin.

Conjugation of Bahing Verbs.

I.—Paradigm of verbs transitive in "wo."
Root Já, to eat. Imperative já-wo.

Active Voice.

Imperative Mood.

1. *Singular of Agent.*	1. *Dual of Agent.*	1. *Plural of Agent.*
Já-wo, eat it.	Já-se, ye two eat it.	Já-ne, ye all eat it.
2. *Dual of Object.*	2. *Dual of Object.*	2. *Dual of Object.*
Já-wosi, eat them two.	Já-sesi, ye two eat them two.	Já-nési, ye all eat them two.
3. *Plural of Object.*	3. *Plural of Object.*	3. *Plural of Object,*
Já-womi, eat them all.	Jásemi, ye two eat them all.	Jánémi, ye all eat them all.

Negative Form.

By má prefixed Má já wo, &c. and so in all the subsequent moods.

Indicative Mood.

Present and Future Tenses.

Singular of Agent.	*Dual of Agent.*	*Plural of Agent.*
	First Person.	
1. Já-gna, I eat or will eat it.	1. Já-sa, inclusive. Ja-suku, exclusive. We two eat it.	1. Já-ya, inclusive. Já-ka, exclusive. We all eat it.

Dual of Object.	*Dual of Object.*	*Dual of Object.*
2. Ja-gna-si, I eat them two.	2. Ja-sa-si, inclusive, Ja-sukusi, exclusive, We two eat them two.	2. Já-ya-si, inclusive. Já-ka-si, exclusive. We all eat them two.
Plural of Object.	*Plural of Object.*	*Plural of Object.*
3. Ja-gna-mi, I eat them all.	3. Ja-sa-mi, inclusive, Ja-suku-mi, excl. We two eat them all.	3. Ja-yami, incl. Ja-ka-mi, excl. We all eat them all.*

Second Person.

1. Já-(y) í.	1. Já-si.	1. Ja-ni.
2. Já-(y)-i-si.	2. Já-si-si.	2. Já-ni-si.
3. Já (y)-i-mi.	3. Já-si-mi.	3. Já-ni-mi.

Third Person.

1. Ja-wa.	1. Já-se.	1. Já-me.
2. Já-wa-si.	2. Já-se-si.	2. Já-me-si.
3. Já-wa-mi.	3. Já-se-mi.	3. Ja-me-mi.

Preterite Tense.

First Person.

1. Já-tong.	1. Já-tá-sá, incl. Já-tá-súku, excl.†	1. Ján-tá-yo, incl. Ják-tá-ko, excl.
2. Já-t-óng-si.	2. Já-tá-sá-si, incl. Já-tá-súkú-si, excl.	2. Ján-tá-yo-si, incl. Ják-tá-kó-si, excl.
3. Já-t-óng-mi.	3. Já-tá-sá-mi, incl. Já-tá-sú-kú-mi, excl.	3. Ján-tá-yó-mi, incl. Ják-tá-kó-mi, excl.

N. B.—The intercalated n and k are devious. See on.

Second Person.

1. Jáp-t-eu.	1. Já-tá-si.	1. Ján-tá-ni.
2. Jáp-t-eu-si.	2. Já-tá-si-si.	2. Ján-tá-ni-si.
3. Jáp-t-eu-mi.	3. Já-tá-si-mi.	3. Ján-tá-ni-mi.

N. B.—The intercalated p and n are devious.

Third Person.

1. Jáp-t-a.	1. Já-ta-se.	1. Jám-ta-me.
2. Jáp-t-asi.	2. Já-tá-se-si.	2. Jám-ta-me-si.
3. Jáp-t-a-mi.	8. Já-ta-se-mi.	3. Jám-ta-me-mi.

N. B.—The intercalated p and m are devious.

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* The form of the conjugation in the remaining persons of the indicative mood being the same as in the first person (and also in the imperative) it is needless to load the paper with repetitions of the names of the numbers, agentive and objective, or with the English equivalents.

† Observe that the separation of the syllables is merely to facilitate the student's comprehension, and that I shall do so no further, for the genius of the language is averse to any such treatment of its finely blended elements.

Infinitive Mood.

Já-cho, to eat or to have eaten, aoristic.

Participles.

(Take notice that all the participles are essentially relative and that they correspond as to sense with nouns, substantival or adjectival ad libitum.)

1st. Participle of the Agent.

Impersonal Form.

Já-ba, the eater, who eats, or ate, or will eat; aoristic.

N. B.—This participle has no impersonated equivalent.

2nd. Paticiple of the Object and of the Instrument also expressive of Habit and of Fitness.

Present and future time.

Impersonal form.

Jácho-me, eatable, what is usually eaten or is fit to eat (to be eaten) what or whom any one eats or will eat (food), and what he eats or will eat with (teeth).

3rd. Participle of the Object and of the Instrument.

Past time.

Impersonal form.

Já-na, eaten, what or wherewith any one ate (also what has been eaten).

4th. Personated equivalent of 2nd Participle, supra.

First person.

Singular of Agent.	*Dual of Agent.*	*Plural of Agent.*
1. Ja-gname, the one that I eat.	1. Jasame, Jasukume, the one that we two eat.	1. Jayame, Jakame, the one that we all eat.
Dual of Object.	*Dual of Object.*	*Dual of Object.*
2. Jagnasime, the two that I eat.	2. Jasasime, Jasukusime, the two that we two eat.	2. Jayasime, Jakasime, the two that we all eat.
Plural of Object.	*Plural of Object.*	*Plural of Object.*
3. Jagnamime, the all that I eat.	3. Jasamime, Jasukumime, the all that we two eat.	3. Jayamime, Jakamime, the all that we all eat.

Second person.

1. Jayime.	1. Jasime.	1. Janime.
2. Jayisime.	2. Jasisime.	2. Janisime.
3. Jayimime.	3. Jasimime.	3. Janimime.

Third person.

1. Jawame.	1. Jaseme.	1. Jameme.
2. Jawasime.	2. Jasesime.	2. Jamesime.
3. Jawamime.	3. Jasemime.	3. Jamemime.

These (2nd and 3rd person) of course mean respectively what or wherewith thou and he (or she) eats or will eat, &c. see note to 1st person of indicative mood.

5th. Impersonated equivalent of 3rd Participle, supra.

	First Person.	
1. Já tongme, (the one that I ate.)	1. Játasame. Játasukume.	1. Jántayome. Jáktakome.
2. Játongsime.	2. Játasasime. Játasukusime.	2. Jántayosime. Jáktakosime.
3. Játongmime.	3. Játasamime. Játasukumime.	3. Jántayomime. Jáktakomime.
	Second Person.	
1. Jápteume.	1. Játasime.	1. Jántanime.
2. Jápteusime.	2. Játasisime.	2. Jántanisime.
3. Jápteumime.	3. Játasimime.	3. Jántanimine;
	Third Person.	
1. Jáptame.	1. Játaseme.	1. Jámtameme.
2. Jáptasime.	2. Játasesime.	2. Jámtamesime.
3. Jáptamime.	3. Játasemime.	3. Jántanimime.*

Gerunds.

Gerund of the present and future time, impersonal.

There is none.

Gerund of present and future time personated.

1st.—With main Verb in present or future time.

	First person.	
Singular of Agent.	*Dual of Agent.*	*Plural of Agent.*
1. Jagnana, I eating it, shall do so and so.	1. Jasana, exclusive. Jasukuna, incl.	1. Jayana, incl. Jakana, excl.
Dual of Object.	*Dual of Object.*	*Dual of Object.*
2. Jagnasina.	2. Jasasina, incl. Jasakusina, excl.	2. Jayasina, incl. Jakasina, excl.
Plural of Object.	*Plural of Object.*	*Plural of Object.*
3. Jagnamina.	3. Jasamina, incl. Jasukumina, excl.	3. Jayamina, incl. Jakamina, excl.
	Second person.	
1. Jayina.	1. Jasina.	1. Janina.
2. Jayisina.	2. Jasisina.	2. Janisina.
3. Jayimina.	3. Jasimina.	3. Janimina.
	Third person.	
1. Jawana.	1. Jasena.	1. Jamena.
2. Jawasina.	2. Jasesina.	2. Jamesina.
3. Jawamina.	3. Jasemina.	3. Jamemina.

* The above forms of the participle and gerund add merely the respective formative particles to the several tense forms; being "me" for the participle and "na" for the gerund.

2nd.—Same Gerund, personated with main verb in Preterite.

First person.

1. Jatongna, (I eating it, did so and so).	1. Jatasana, inclusive. / Jatasukuna, excl.	1. Jantayóna, incl. / Jaktakóna, excl.
2. Jatongsina.	2. Jatasasina, incl. / Jatasukusina, excl.	2. Jantayósina, incl. / Jaktakósina, excl.
3. Jatongmina.	3. Jatasamina, incl. / Jatasukumina, excl.	3. Jantayómina, incl. / Jaktakómina, excl.

Second person.

1. Japteuna.	1. Jatasina.	1. Jantanina.
2. Japteusina.	2. Jatasisina.	2. Jantanisina.
3. Japteumina.	3. Jatasimina.	3. Jantanimina.

Third person.

1. Japtana.	1. Jatasena.	1. Jamtamena.
2. Japtasina.	2. Jatasesina.	2. Jamtamesina.
3. Japtamina.	3. Jatasemina.	3. Jamtamemina.*

Gerund of past time, impersonal Jáso, and Jásomami.†

Same Gerund, personated.

1st.—With main vreb in present or future.

First person.

Singular of Agent.	*Dual of Agent.*	*Plural of Agent.*
1. Jagnako, (I having ate it, will do so and so).	1. Jasako, incl. / Jasukuko, excl.	1. Jayako, incl. / Jakako, excl.
Dual of Object.	*Dual of Object.*	*Dual of Object.*
2. Jagnasiko.	2. Jasasiko, incl. / Jasukusiko, excl.	2. Jayasiko, incl. / Jakasiko, excl.
Plural of Object.	*Plural of Object.*	*Plural of Object.*
3. Jagnamiko.	3. Jasamiko, incl. / Jasukumiko, excl.	3. Jayamiko, incl. / Jakamiko, excl.

Second person.

1. Jayiko.	1. Jasiko.	1. Janiko.
2. Jayisiko.	2. Jasisiko.	2. Janisiko.
3. Jayimiko.	3. Jasimiko.	3. Janimiko.

Third person.

1. Jawako.	1. Jaseko.	1. Jameko.
2. Jawasiko.	2. Jasesiko.	2. Jamesiko.
3. Jawamiko.	3. Jasemiko.	3. Jamemiko.

* The above forms of the participle and gerund add merely the respective formative particles to the several tense forms; being "me" for the participle and "na" for the gerund.

† See remark in the sequel on Jásógno with the auxiliary.

2nd.—The same Gerund with the main Vebb in the Preterite.

First person.

1. Jatangko, (I having ate it did so and so.	1. Jatasako, incl. Jatasukuko, excl.	1. Jantayoko, incl. Jaktakoko, excl.
2. Jatongsiko.	2. Jatasasiko, incl. Jatasukusiko, excl.	2. Jantayosiko, incl. Jaktakosiko, excl.
3. Jatongmiko.	3. Jatasamiko, incl. Jatasukumiko, excl.	3. Jantayomiko, incl. Jaktakomiko, excl.

Second person.

1. Japteuko.	1. Jatasiko.	1. Jantaniko.
2. Japteusiko.	2. Jatasisiko.	2. Jantanisiko.
3. Japteumiko.	3. Jatasimiko.	3. Jantanimiko.

Third person.

1. Japtako.	1. Jataseko.	1. Jamtameko.
2. Japtasiko.	2. Jatasisiko.	2. Jamtamesiko.
3. Japtamiko.	3. Jatasemiko.	3. Jamtamemiko.*

Reflex transitive, or middle voice† *of the transitive verb to eat.*

Imperative Mood.

Singular.	*Dual.*	*Plural.*
Jáso, eat thyself.	Jás-che, ye two eat yourselves.	Jásine,‡ ye all eat yourselves.

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* Here as before, the gerundial impersonated forms are constructed by merely adding the past gerund sign or "ko" to the several forms of the tenses; and as in the indicative mood, there are 33 personal forms proper to either time (present or future and preterite) so there are 66 forms of the gerund of past time and in like manner are there 66 of the gerund of present time; and so also of the participles, not to add the three impersonate forms of the latter, making with them 69! This is a more than Manchuric luxuriance of participial and gerundial growth. I have now gone through the most essential and characteristic forms of the verb, and shall reserve the less essential or the several other so called moods &c. for the sequel, proceeding first to the reflex or middle voice and then to the passive upon the present model. The gerunds are purely verbal with no touch of the noun, and they are essentially continuative, serving in lieu of the conjunction "and."

† There are a great many primitives or neuters in "so," besides the derivatives or reflex forms of the transitives which I call their middle voice. All transitives make their middle voice by changing their appropriate sign into "so." This form is perfectly uniform for all primitives and derivatives. The French amuser and s'amuser, = cham-cho and cham-s-cho give a good idea of it.

‡ There are of course no objective forms of an intransitive verb, and all verbs in "so," whether primitively neuter or derived, as here from transitives, are so regarded. See and compare the transitive forms in the active voice aforegone.

Indicative Mood.

Present and Future Tense.

First person.

Singular.	*Dual.*	*Plural.*
Jásigna.	Jás-cha, incl. Jás-chuku, excl.	Jásiya, incl. Jásika, excl.

Second person.

Jáse.	Jás-chi.	Jásini.

Third person.

Jase.	Jás-che.	Jásime.

Preterite Tense.

First person.

Jasti.	Jastasa. incl. Jastasuku, excl.	Jastayo, incl. Jastako, excl.

Second person.

Jaste.	Jastasi.	Jastani.

Third person.

Jasta.	Jastasa.	Jastame.

Infinitive Mood.

Jascho, to eat, or to have eaten one's self, aoristic.

Participles.

1st.—Participle of the Agent, impersonal.

Jásiba, the self-eater, one who eats, or will eat or ate himself, aoristic.

2nd.—Participle of the Object and Instrument.

Present and Future Time.

Impersonal Form.

Jaschome, his own that any one eats or will eat, self eatable, what is self eaten or wherewith to eat self.

3rd.—Same Participle of time past, impersonal.

Jasina, his own (flesh) that any one ate, or what has been self eaten by any one; and wherewith it has been self eaten* or his own (teeth) wherewith any one ate.

4th.—Impersonated equivalent of Participle 2nd in Chome.

First person.

Singular.	*Dual.*	*Plural.*
Jasigname, my own that I eat or eat with.	Jaschame, incl. Jaschukume, excl.	Jasiyame, incl. Jasikame, excl.

* The participles in cho-me and in na are scarcely useable in derivative verbs in "so" like Jaso, but more freely in primitives of the same formation such as wáso = caco, e. g., was-chome khli voidable ordure, and wásina khli = voided ordure, that is, the ordure which will be and has been, voided. This shows the passive bent of these participles and the affinity of neuter verbs to passives. See Classification of Verbs.

Second person.

Jaseme.	Jaschime.	Jasinime.

Third person.

Jaseme.	Jascheme.	Jasimeme.

5TH.—IMPERSONATED EQUIVALENT OF PARTICIPLE 3RD IN "NA."

Singular.	*Dual.*	*Plural.*
	First person.	
Jastime, my own that I ate.	Jastasame, incl. Jastasukume, excl.	Jastayome, incl. Jastakome, excl.
	Second person.	
Jasteme.	Jastasime.	Jastanime.
	Third person.	
Jastame.	Jastaseme.	Jastameme.

GERUNDS.

Gerund of present and future time, impersonal.

There is none.

Gerund of present and future time, personated.

1ST.—WITH MAIN VERB IN SAME TIME.

Singular.	*Dual.*	*Plural.*
	First person.	
Jasignana, (I eating my own flesh shall do so) and so).	Jaschana, incl. Jaschukuna, excl.	Jasiyana, incl. Jasikana, excl.
	Second person.	
Jasena.	Jaschina.	Jasinina.
	Third person.	
Jasena.	Jaschena.	Jasimena.

2ND.—SAME GERUND PERSONATED WITH MAIN VERB IN PAST TENSE.

	First person.	
Jastina, (I eating my own flesh did so and so.)	Jastasana, incl. Jastasukuna, excl.	Jastayona, incl. Jastakona, excl.
	Second person.	
Jastena.	Jastasina.	Jastanina.
	Third person.	
Jastana.	Jastasena.	Jastamena.

Gerund of past time, impersonal.

There is none.

Same gerund personated.

1ST.—WITH MAIN VERB IN PRESENT OR FUTURE.

	First person.	
Jasignako, (I having eaten my own flesh shall do so and so.)	Jaschako, incl. Jaschukuko, excl.	Jasiyako, incl. Jasikako, excl.

Second person.

Jaseko.	Jaschiko.	Jasiniko.

Third person.

Jaseko.	Jascheko.	Jasimeko.

2ND.—SAME GERUND WITH MAIN VERB IN THE PRETERITE.

Singular.	*Dual.*	*Plural.*
	First person.	
Jastiko, (I having eaten my own did so and so).	Jastasako, incl. Jastasukuko, excl.	Jastayoko, incl. Jastakoko, excl.
	Second person.	
Jasteko.	Jastasiko.	Jastaniko.
	Third person.	
Jastako.	Jastaseko.	Jastameko.

Passive voice of the same verb.

(Basis, Jayi = eat me).

IMPERATIVE MOOD.

Singular of Object.	*Dual of Object.*	*Plural of Object.*
1. Jáyi, eat me thou.	1. Jásiki, eat us two thou.	1. Jáki, eat us all thou.
Dual of Agent.	*Dual of Agent.*	*Dual of Agent.*
2. Jáyisi, eat me ye two.	2. Jasikisi, eat us two ye two.	2. Jákisi, eat us all ye two.
Plural of Agent.	*Plural of Agent.*	*Plural of Agent.*
3. Jáyini, eat me ye all.	3. Jásikini, eat us two ye all.	3. Jákini, eat us all ye all.*

INDICATIVE MOOD.

Present and Future Tense.

First person.

Singular of Object.	*Dual of Object.*	*Plural of Object.*
1. Jáyí, eats me he, = I am eaten by him.	1. Jáso, incl. Jásiki, excl. We two are eaten by him.	1. Jáso, incl. Jáki, excl. We all are eaten by him.

* Observe that of the active voice of the transitive the object is him or her or it; of the middle voice the object is self; and of the passive the object is me, but that the order of arrangement of agent and object is reversed in the passive as compared with the active voice and so also in the indicative mood. This is done in conformity to the genius of this language which requires the attention to be primarily fixed on the agent in one voice, on the object in the other. It will be seen in the sequel that there are further special forms of the verb to denote the action which passes from me to thee and from thee to me. These are necessary complements of the passive voice in a language which makes the mention of agents and patients inseparable from that of the action.

Dual of Agent.	*Dual of Agent.*	*Dual of Agent.*
2. Jayisi, I am eaten by them two.	2. Jasosi, incl. Jasikisi, excl. We two are eaten by them two.	2. Jasosi, Jakisi, We all are eaten by them two.
Plural of Agent.	*Plural of Agent.*	*Plural of Agent.*
3. Jayimi, I am eaten by them all.	3. Jasomi, incl. Jasikimi, excl. We two are eaten by them all.	3. Jasomi, incl. Jakimi, excl. We all are eaten by them all.

N. B.—The agent is always of the 3rd person, he, she, or it; if it be 2nd person the conjugation is another.

Second person.

1. Jaye.	1. Jasi.	1. Jani.
2. Jayesi.	2. Jasisi.	2. Janisi.
3. Jayemi.	3. Jasimi.	3. Janimi.

Third person.

1. Jawa.	1. Jawasi.	1. Jawami.
2. Jase.	2. Jasesi.	2. Jasemi.
3. Jame.	3. Jamesi.	3. Jamemi.

Preterite Tense.

First person.

1. Jati.	1. Jataso, incl. Jatasiki, excl.	1. Jataso, incl. Jáktaki, excl.
2. Jatisi.	2. Jatasosi, incl. Jatasikisi, excl.	2. Jatasosi. Jaktakisi.
3. Jatimi.	3. Jatasomi, incl. Jatasikimi, excl.	3. Jatasomi. Jaktakimi.

Second person.

1. Jate.	1. Jatasi.	1. Jantani.
2. Jatesi.	2. Jatasisi.	2. Jantanisi.
3. Jatemi.	3. Jatasimi.	3. Jantanimi.

Third person.

1. Japta.	1. Japtasi.	1. Japtami.
2. Jatase.	2. Jatasesi.	2. Jatasemi.
3. Jamtame.	3. Jamtamesi.	3. Jamtamemi.

Infinitive Mood.

There is none properly so called.

The sense is conveyed by placing the separate pronoun in the objective case before the verb in the active voice. Gó jácho, = to eat me, = to be eaten.

Participles.

1st.—Participle of the agent in "ba" is of course wanting.

2nd.—Participle of the object in "chome" is rather passive than active though used in both voices, as we say in English what (or whom) any one eats or is wont to eat or what is wont to be eaten by any one.

3rd.—Participle in "na," is yet more purely passive, Já-na, what has been eaten. But it is used with more than English license as though it belonged to the active voice, what any one hath eaten.

4th.—Personated equivalent of the 2nd of the above. It is formed by adding the formative suffix "me" to the sevéral tense forms of the indicative present and future of this voice, e. g.

Singular of Agent.	*Dual of Agent.*	*Plural of Agent.*
1. Jayime.	1. { Jásome, incl. Jasikime, excl.	1. { Jásome, incl. Jákime, excl.

and so on through the whole of the thirty-three forms above given in the indicative.

5th.—Personated equivalent of the 3rd of the above participles or that in "na." It is formed as above by adding the formative "me" to the several forms of the preterite indicative of this voice, e. g.

1. Jatime.	1. { Jatasome, incl. Jatasikime, excl.	1. { Jatasome, incl. Jatakime, excl.

and so on through all the 33 forms of the three persons of the preterite passive. Jayime means I who am the eaten of him, and Jatime, I who was the eaten of him, and so of all the rest.

N. B.—The impersonal forms in this, and of the active and middle voices are declinable like nouns. The personated in "me" which take so much of the verb character are indeclinable. Both are thoroughly and intrinsically relative in sense.

Gerunds.

Gerund of future and present time, impersonal.

There is none.

The same gerund personated.

1st.—With the main verb in same time.

It is formed by the addition of the appropriate formative or "na" to the several forms of the present and future indicative of this voice, e. g.

Singular.	*Dual.*	*Plural.*
1. Jáyina.	1. { Jasona, incl. Jasikina, excl.	1. { Jasona, incl. Jakina, excl.

and so on through all the 33 forms of the three persons of the indicative.

2nd.—The same gerund personated with the main verb in the preterite.

It is formed by suffixing the "na" to the preterite indicative forms, e. g.

Singular.	*Dual.*	*Plural.*
1. Jatina.	1. { Jatasona, incl. Jatasikina, excl.	1. { Jatasona, incl. Jatakina, excl.

Samples of the sense. Being eaten I shall cry out, Jáyina brégna: being eaten I cried out, Játína bréti.*

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* Observe that the root bré, to cry out, is here conjugated as an intransitive. Elsewhere I have given the same root conjugated as a transitive in the sense of to summon. The infinitive and imperative (bre-cho, bre-to) are identical. This double indicative conjugation from the same root of words having nearly identical senses is very common, as úto, to fall and to fell, Jikko to be broken, and to break, &c. Bréto, the intransitive, is conjugated like gnito, to be afraid, the type of regular intransitives in "to."

Gerund of past time, impersonal.

There is none.

Same gerund personated.

1st.—With main verb in present or future.

It is formed by adding the formative "ko" to the several forms (33) of the indicative present and future, e. g.

Singular.	*Dual.*	*Plural.*
1. Jayiko.	1. { Jásoko, incl. / Jásikiko, excl.	1. { Jásoko, incl. / Jákiko, excl.

2nd.—Same gerund with the main verb in the preterite.

It is formed as above by adding "ko" to the several forms of the indicative preterite, e. g.

1. Jatiko.	1. { Jatasoko, incl. / Jatasikiko, excl.	1. { Jatasoko, incl. / Jatakiko, excl.

and so on through all the 33 forms of the indicative preterite of this voice. The senses respectively of Jayiko and Jatiko are, having been eaten I shall be, and, having been eaten, I was or have been, (forgotten) ; and so of the rest.

Paradigm of certain special forms of conjugation supplementary of the passive and denoting

1st, the action that passes between me as the agent and thee as the patient. 2nd, that in which thou art the agent and I the patient. The first of these forms is very distinct, but is confined to the indicative (and subjunctive) mood.

It has no imperative or infinitive. The second runs much into the ordinary passive and has an imperative. See on.

1st form, I—thee.

(Verb Já, to eat, as before).

Indicative Mood.

Present and Future Tense.

*Singular of Agent.**	*Dual of Agent.*	*Plural of Agent.*
1. Jáná, I eat thee or thou art eaten by me.	Jáyesi. We two eat thee.	Jáyemi. We all eat thee.
Dual of Object.	*Dual of Object.*	*Dual of Object.*
2. Jánási, I eat you two.	Jásisi. We two eat you two.	Jásimi. We all eat you two.
Plural of Object.	*Plural of Object.*	*Plural of Object.*
3. Jánáni, I eat you all.	Jánisi. We two eat you all.	Jánimi. We all eat you all.

---

* This form is rather allied to the passive than active, and may be called the supplement of the former, which is very incomplete and alien to the genius of the tongue, being cramped at the threshold by taking the 1st person objective for its starting point, thus, jayi = eat me. There is no Be thou eaten. And here jana, and its participial janame look to the object chiefly, thou art eaten by me and thou who art the eaten of me.

Preterite Tense.

1. Jantana, I ate thee, or, thou wast eaten by me.	Játesi. We two ate thee.	Játemi. We all ate thee.
2. Jántanasi, I ate you two.	Játasisi, We two ate you two.	Játasimi. We all ate you two.
3. Jantanani, I ate you all.	Jántanisi. We two ate you all.	Jántanimi. We all ate you all.

Participles.

There are none of the impersonal form.

Participle of the future personated.

It is formed, as in the ordinary conjugation, by adding the appropriate particle or "me" to the forms of the indicative, e. g.

Singular.	*Dual.*	*Plural.*
Janame.	Jayesime.	Jayemime.*

and so on through all the 9 forms above given in the indicative present.

Participle of the past personated. It is formed from the preterite by adding the "me," e. g.

Jantaname.	Jatesime.	Jatemime,

and so on through the above 9 forms of the preterite.

The sense of Jáname is, thou who art the eaten of me; of jantaname, thou who wert the eaten of me, and so of all the rest.

Gerunds.

There are none whatever impersonated.

The personated forms are, as in the ordinary conjugation, four, two of the present and two of the past, and they are constructed, as before, by adding, respectively "na" and "ko" to the tense forms above, e. g.

Gerund of the future and present with the main verb in same time.

Singular.	*Dual.*	*Plural.*
Janana.	Jayesina.	Jayemina,

and so on through all the 9 forms of the tense.

Same gerund with the main verb in the preterite.

Singular.	*Dual.*	*Plural.*
Jantanana.	Jatesina.	Jatemina,

and so on through all the 9 forms above.

Gerund of the preterite with main verb in the past time.

Singular.	*Dual.*	*Plural.*
Jantanako.†	Jatesiko.	Jatemiko,

and so on through the 9 tense forms.

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* The "y" is merely to keep the vowels apart.

† Samples of the above gerunds. Eating thee I shall fill my belly, jánana rúgna: Eating thee I filled my belly, jantana rúti: Having eaten thee I will go, janako lágna: Having eaten thee I slept, jántanako ipti: We all having eaten thee, were pleased, jatemiko gyérstako: We two, having eaten thee, will flee, jayesiko juksukasuku: We all, eating thee, fled, jatemina júkkatako.

2nd.—Special form, Thou—me.

Imperative Mood.

Singular of Agent.	*Dual of Agent.*	*Plural of Agent.*
1. Jáyi,* Eat me thou or let me be eaten by thee.	1. Jáyísi.	1. Jáyíni.
Dual of Object.	*Dual of Object.*	*Dual of Object.*
2. Jasiki.	2. Jasikisi.	2. Jasikini.
Plural of Object.	*Plural of Object.*	*Plural of Object.*
3. Jaki.	3. Jakisi.	3. Jakini.

N. B.—This tallies with the ordinary passive as will be seen by reading the vertical columns of the one with the horizontal of the other.

Indicative Mood.

Present and Future Tense.

1. Jáyi, (Thou eatest me, or I am eaten by thee.)	1. Jayisi.	1. Jayini.
2. Jásiki.	2. Jasikisi.	2. Jasikini.
3. Jáki.	3. Jakisi.	3. Jakini.

Preterite.

1. Jati.	1. Jatasi.	1. Jatini.
2. Jatasiki.	2. Jatasikisi.	2. Jatasikini.
3. Jaktaki.	3. Jaktakisi.	3. Jaktakini.

N. B.—These agree respectively with the present and preterite of the passive save 1st, that there are here no inclusive forms, and 2nd, that the personal sign ni stands here in place of the passive mi.

Infinitive Mood.

Wanting: the ordinary infinitive is used with the separate pronouns in the instrumental and objective cases, gami go jácho.

Participles.

There are none of the impersonated kind.

The personated are formed, as usual, by the "me" suffix added to the tense forms, e. g.

Singular.	*Dual.*	*Plural.*
Jayime.	Jayisime.	Jayinime,

and so on through the 9 tense forms.

Singular.	*Dual.*	*Plural.*
Jatime.	Jatisime.	Jatinime,

and so on through the 9 tense forms above.

---

* This is the formula of the passive, because the passive only requires that the first person be the patient, allowing the 2nd or 3rd to be the agent, and hence the indicative of this form so nearly tallies with that of the passive, jayi, eat me he or thou, &c.

The senses of Jayime and Jatime are, I who am the eaten of thee, and I who was the eaten of thee. The sense would be equally expressed by thou who art my eater, but eater jába is purely active, and cannot be admitted into an agento-objective verb.

Gerunds.

Unpersonated, there are none.

The personated of the present are formed as before by "na" suffixed to the several tense forms; and those of the past by "ko" similarly affixed; e. g. jáyina, játina, and jáyiko, jatiko, equivalent to thou eating me wilt do so and so, and did so and so; and thou having ate me wilt do, and did, so and so.

Paradigm of transitives in "to," not changing the "t" into "d."*

Root, bré, to summon.

Active Voice.

Imperative Mood.

Singular.	*Dual.*	*Plural.*
1. Bréto.	1. Brétise.	1. Brétine.
Dual of Object.	*Dual of Object.*	*Dual of Object.*
2. Brétosi.	2. Brétisesi.	2. Brétinesi.
Plural of Object.	*Plural of Object.*	*Plural of Object.*
3. Brétomi.	3. Brétisemi.	3. Brétinemi.

Indicative Mood.

Present and Future Tense.

	First person.	
1. Brétú.	1. Brétisa, incl. / Brétisuku, excl.	1. Brétiya, incl. / Brétika, excl.
2. Brétusi.	2. Brétisasi. / Brétisukusi.	2. Brétiyasi. / Brétikasi.
3. Brétúmi.	3. Brétisami. / Brétisukumi.	3. Brétiyami. / Brétikami.
	Second person.	
1. Bréti.	1. Brétisi.	1. Brétini.
2. Brétisi.	2. Brétisisi.	2. Brétinisi.
3. Brétimi.	3. Brétisimi.	3. Brétinimi.
	Third person.	
1. Bréta.	1. Brétise.	1. Brétime.
2. Brétasi.	2. Bretisesi.	2. Brétimesi.
3. Brétami.	3. Bretisemi.	3. Brétimémi.

---

* Those that change the "t" of the imperative into "d" in the indicative, do not take the incrementive "ti" of the dual and plural present, nor the double t of the preterite, and they have í, not ti, in the passive. These peculiarities are in fact confined to the transitives in unchanging "to," but are partially shared by the changing transitives and by the neuters.—See classification of verbs.

Preterite.

First person.

1. Bréttong.	1. Bréttasa, incl. / Bréttasuku, excl.	1. Bréttayo, incl. / Brettako, excl.
2. Bréttongsi.	2. Bréttasasi, incl. / Bréttasukusi, excl.	2. Bréttayosi, incl. / Bréttakosi, excl.
3. Bréttongmi.	3. Bréttasami, incl. / Bréttasukumi, excl.	3. Bréttayomi, incl. / Bréttakomi, excl.

Second person.

1. Brétteu.	1. Bréttasi.	1. Brettani.
2. Bretteusi.	2. Bréttasisi.	2. Bréttanisi.
3. Bretteumi.	3. Bréttasimi.	3. Brettanimi.

Third person.

1. Brétta.	1. Bréttase.	1. Bréttame.
2. Bréttasi.	2. Bréttasesi.	2. Bréttamesi.
3. Bréttami.	3. Bréttasemi.	3. Bréttamemi.

Infinitive Mood.

Bré-cho, to call or to have called, &c.

Participles.

1st, in ba, Bré-ba, who calls or called.

2nd, in chome, Bréchome, { whom any one calls or will call. / who will be called.

3rd, in na, Bré-na, { whom any one has called. / who has been called.

4th, in me, Brétume, &c. { whom I call, or shall call. / who will be called by me.

5th, in me, Bréttongme, &c. { whom I called. / who has been called by me.

Gerund of the past, impersonal, Bréso or Bresomami.

(None of the present).

Gerunds personated.

1st, in na, Brétuna, &c. I calling (will do so and so.)
2nd, in na, Bréttongna, &c. I calling (did so and so.)
3rd, in ko, Brétuko, &c. I having called (will do so and so.)
4th, in ko, Bréttongko, &c. I having called (did so and so.)

Middle Voice.

Breso, call thyself. Precisely like Jáso.

Passive Voice.

Imperative Mood.

1. Bréti.	1. Brétisiki.	1. Brétiki.
2. Brétisi.	2. Brétisikisi.	2. Bretikisi.
3. Brétini.	3. Bretisikini.	3. Brétikini.

Indicative Present.

First person.

1. Bréti.	1. Brétiso, incl. / Brétisiki, excl.	1. Brétiso, incl. / Brétiki, excl.
2. Brétisi.	2. Brétisosi, incl. / Brétisikisi, excl.	2. Brétisosi, incl. / Brétikisi, excl.
3. Brétimi.	3. Brétisomi, incl. / Brétisikimi, excl.	3. Brétisomi, incl. / Brétikimi, excl.

Second person.

1. Bréte.	1. Brétisi.	1. Brétini.
2. Brétesi.	2. Brétisisi.	2. Brétinisi.
3. Brétemi.	3. Brétisimi.	3. Brétinimi.

Third person.

1. Bréta.	1. Brétasi.	1. Brétami.
2. Brétise.	2. Brétisesi.	2. Brétisemi.
3. Brétime.	3. Brétimesi.	3. Brétimemi.

Preterite.

First person.

1. Brétti.	1. Bréttaso, incl. / Bréttasiki, excl.	1. Bréttaso, incl. / Bréttaki, excl.
2. Bréttisi.	2. Bréttasosi, incl. / Bréttasikisi. excl.	2. Bréttasosi, incl. / Bréttakisi, excl.
3. Bréttimi.	3. Bréttasomi, incl. / Bréttasikimi, excl.	3. Bréttasomi, incl. / Brettakimi, excl.

Second person.

1. Brétte.	1. Bréttasi.	1. Bréttani.
2. Bréttesi.	2. Bréttasisi.	2. Bréttanisi.
3. Bréttemi.	3. Bréttasimi.	3. Bréttanimi.

Third person.

1. Brétta.	1. Brettasi.	1. Brettami.
2. Bréttase.	2. Brettasesi.	2. Brettasemi.
3. Bréttame.	3. Brettamesi.	3. Brettamemi.

Infinitive Mood.

Brécho, precisely as in the last verb.

Participles.

1st, in bá. Wanting, as in the last.
2nd, in chome. Bréchome, precisely as in the last.
3rd, in na. Bréna, ditto, ditto.
4th, in me. Brétime &c. as before.
5th, in me. Bréttime, &c. as before.

Gerunds.

1st, in na. Brétina,
2nd, in na. Bréttina,
3rd, in ko. Brétiko,
4th, in ko. Bréttiko, &c. as before.

Special Form I.

Indicative present.

1. Brétina.	1. Brétesi.	1. Brétemi.
2. Brétinasi.	2. Brétisisi.	2. Brétisimi.
3. Brétinani.	3. Brétinisi.	3. Brétinimi.

Preterite.

1. Bréttana.	1. Bréttesi.	1. Bréttemi.
2. Bréttanasi.	2. Bréttasisi.	2. Bréttasimi.
3. Bréttanani.	3. Bréttanisi.	3. Bréttanimi.

Infinitive Mood.

None. Gomi ga brécho, expresses the sense.

Participles.

Impersonal none.

1st personated.	Brétiname, &c.
2nd ,,	Bréttaname, &c.

Gerunds.

Impersonal none.

1st personated.	Brétinana, &c.
2nd ,,	Bréttanana, &c.
3rd ,,	Brétinako, &c.
4th ,,	Bréttanako, &c.

Special Form II.

Imperative.

1. Bréti.	1. Brétisi.	1. Brétini.
2. Brétisiki.	2. Brétisikisi.	2. Brétisikini.
3. Brétiki.	3. Brétikisi.	3. Brétikini.

Indicative present.

1. Bréti.	1. Brétisi.	1. Brétini.
2. Brétisiki.	2. Brétisikisi.	2. Brétisikini.
3. Brétiki.	3. Brétikisi.	3. Brétikini.

Preterite.

1. Brétti.	1. Bréttisi.	1. Bréttini.
2. Bréttasiki.	2. Bréttasikisi.	2. Bréttasikini.
3. Bréttaki.	3. Bréttakisi.	3. Bréttakini.

Infinitive Mood.

There is none. Gami gó brécho expresses the sense.

Participles.

Impersonal none.

1st personated.	Brétime, &c.	as before, by "me" added to the tense forms.
2nd ,,	Bréttime, &c.	

Gerunds.

Impersonal of the past (none of present).

Bréso or Brésomami.

Ditto personated.

1st personated.	Bretina, &c.	As before by "ná" added to the several forms of the tenses.
2nd ,,	Bréttina, &c.	
3rd ,,	Brétiko, &c.	
4th ,,	Bréttiko, &c.	

Paradigm of verbs intransitive or neuter.

Not having the silibant sign.

A neuter in "wo," Pi-wo, come thou.

Imperative Mood.

Singular.	*Dual.*	*Plural.*
Piwo.	Pise.	Pine.

Indicative Mood.

Present and Future Tenses.

	First person.	
Singular.	*Dual.*	*Plural.*
Pigna.	Pisa, incl. Pisuku, excl.	Piya, incl. Pika, excl.
	Second person.	
Piye.	Pisi.	Pini.
	Third person.	
Pi.	Pise.	Pime.

Preterite Tense.

	First person.	
Singular	*Dual.*	*Plural.*
Piti.	Pitasa, incl. Pitasuku, excl.	Pintayo, incl. Piktako, excl.
	Second person.	
Pite.	Pitasi.	Pintani.
	Third person.	
Pita.	Pitase.	Pimtame.

Infinitive Mood.

Picho, to come or to have come, aoristic.

Participles.

1st of the Agent, impersonal, aoristic.
Piba, who or what comes, or will come or came.

2nd of the object and instrument.

Future, impersonal.

Pichome, fit to come by (road), and fit for coming with (feet), and what any one will come by (road).

3rd the same, past time, impersonal.

Pina, what any one came by (road) and what he came with (feet).

Impersonated form of 2nd and 3rd.

It is formed by "me" added to the several forms of the tenses, pignáme, pitime, &c.*

Gerunds.

That of present time.

Pígnana,† &c. with main verb in same time.

Pítina, &c. with main verb in preterite.

That of past time.

Pígnako, &c. with main verb in future.

Pítiko, &c. with main verb in past.

All intransitives not having "so" in the imperative are conjugated as above, except certain ones in "to," which I shall distinguish as neuters and which are conjugated as follows.

Paradigm of neuters in "to."

Root Bó, to flower. Imperative, Bó-to.

Imperative Mood.

Singular.	*Dual.*	*Plural.*
Bóto.	Bótise.	Bótine.

Indicative Mood.

Present and Future.

Singular.	*Dual.*	*Plural.*
	First person.	
Bótú.	Bótisa, incl. Bótisuku, excl.	Bótiya, incl. Bótika, excl.
	Second person.	
Bóti.	Bótisi.	Bótini.
	Third person.	
Bóta.	Bótise.	Bótime.

Preterite.

	First person.	
Bótti.	Bottasa, incl. Bóttasuku, excl.	Bóttayo, incl. Bóttako, excl.

* e. g. Pignáme kholi, the feet which I come with, Pignáme lam, the road which I come by. Pitime kholi, the feet which I came with; Pitime lam, the road which I came by.

† e. g. Pignana pagna = I will come and do it, literally I coming will do it.

Second person.

Bótte.	Bóttasi.	Bóttani.

Third person.

Bótta.	Bóttase.	Bóttame.

Infinitive Mood.

Bó-cho.

Participle of the agent in "ba."

Bóba, what flowers, or will flower, or has flowered.

N. B.—The 2nd and 3rd participles in "chome" and "na" are wanting,* and so also their derivatives in "me."

Gerunds.

1st. Bótuna.	Bótina.	Bótana, &c.
2nd. Bóttina.	Bottena.	Bóttana, &c.
3rd. Bótuko.	Bótiko.	Bótako, &c.
4th. Bóttiko.	Bótteko.	Bóttako, &c.

What, as opposed to the above, called neuters (see conjugation XI.) for distinction's sake, I have elsewhere called intransitives in "to," as Jíto, Kháto, &c. (conjugation X.) are all regular and conjugated like the verb to come above given. In fact, all the so-called intransitives, whatever their sign, have one uniform conjugation, those in "so," merely interpolating the reflex sibilant, as may be seen by comparing the aforegone samples of both. But the neuters in "to," here ensampled by Bóto, are quite unique, leaning to the model of unchanging transitives with the same sign, for which see Bréto aforegone.

By comparing the above samples of complete conjugation with the summary view of the same subject which precedes it,† it will be seen that there is at bottom but one conjugation, because all transitives and intransitives follow the one general model with the material exception, however, of the singular indicative. Of that the various forms are therefore brought together in the classification of so-called conjugations; and it is only necessary to add that beyond the singular indicative of transitive verbs, there are no deviations from the one model of conjugating in the three voices. The whole force of conjugation is, it will be seen, thrown upon the actors, who do and suffer. Of the action itself there is little comparative heed, only two moods and two times being developed and the active and passive voices being perplexed. There are not in fact any inflexional or inherent verbal forms to express the various modifications of the action. Nevertheless these modifications, of course, have periphrastic means of expression, I shall call them moods, and now proceed to enumerate them.

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* These participles can rarely be used with intransitive or neuter verbs, never with such of the latter as relate to the action of things. They imply an agent who produces that effect on a thing which these participles express relatively to future and past time respectively. Out of the vast number of intransitives enumerated elsewhere hardly a dozen make use of these participles. Some of these exceptions are bwakko, to speak, which gives bwangna ló,=spoken words. Bokko, to get up, whence bongna blocho, = bed, whence any one has risen: Niso, to sit, whence nisina-khosingba, the chair on which any one has sat, &c.

† To wit, "Classification of Verbs."

Subjunctive or Conditional Mood.

If, or should, I come.

Indicative Present.

First person.

Singular.	*Dual.*	*Plural.*
Pígna khedda.	Písa khedda, incl. Písuku khedda, excl.	Píya khedda, incl. Píka khedda, excl.
	Second person.	
Píye khedda.	Písi khedda.	Píni khedda.
	Third person.	
Pí khedda.	Pise khedda.	Píme khedda.

Preterite.

First person.

Pígnáwa khedda.	Písawa khedda, incl. Pisukuwa khedda, excl.	Píyawa khedda, incl. Píkawa khedda, excl.
	Second person.	
Píyéwa khedda.	Písiwa khedda.	Píniwa khedda.
	Third person.	
Píwa khedda.	Písewa khedda.	Pímewa khedda.

The negative is formed, as usual, by má prefixed.

Another negative, allied if not equivalent, is impersonal and substitutes the particle theum for khedda, adding the separate pronouns personal in lieu of the pronominal suffixes of verbs.

Should I not come, &c.

Present Tense.

First person.

Singular.	*Dual.*	*Plural.*
Gó má pítheum.	Gósi má pítheum, incl. Gósuku má pítheum, excl.	Góyi má pítheum. Góku má pítheum.
	Second person.	
Ga má pítheum.	Gasi má pítheum.	Gani má pítheum.
	Third person.	
Harem má pítheum.	Harem dausi má pítheum.	Harem dau má pítheum.

The preterite of this is formed by adding the "wa" above gone to the correlative part of the sentence, as, had I not come, he would not have come, gó má pítheum, harem má píwa.

In the present or future it is, gó má pítheum, harem má pí = should I come not, he will not come. In both forms of the conditional, wá, added to the indicative, takes the place of the regular preterite piti, pite, pita.

Contingent Mood.

I may (perhaps) go.

It is expressed by the future in the alternative way, e. g. lágna má lágna, má teutu = I shall go, shall not go, I don't know = I may go, or perhaps I shall go, perhaps not, (root, lá, to go).

Potential Mood.

It is formed by adding ne to the root of any main verb (e. g. lá to go) and then subjoining the several conjugational forms of the subsidiary verb to can, which is a regular transitive in "po." This, not having been given above, shall be fully set down here, though it differ not much, save euphonically, from the foregone samples of transitives, especially bréto.*

Root, chap, to can. Infinitive, chap-cho.

Imperative.

Singular.	*Dual.*	*Plural.*
1. Láne chappo.	1. Láne chapse.	1. Láne chamne.
2. Láne chapposi.	2. Láne chapsesi.	2. Láne chamnesi.
3. Láne chappomi.	3. Láne chapsemi.	3. Láne chamnemi.

Indicative present.

First person.

1. Láne chabu.	1. Láne chapsa, incl. Láne chapsuku, excl.	1. Láne chamya, incl. Láne chapka, excl.
2. Láne chabusi.	2. Láne chapasi, incl. Láne chapsukusi, excl.	2. Láne chamyasi, incl. Láne chapkasi, excl.
3. Láne chabumi.	3. Láne chapsami, incl. Láne chapsukumi, excl.	3. Láne chamyami, incl. Láne chapkami, excl.

Second person.

1. Láne chabi.	1. Láne chapsi.	1. Láne chamni.
2. Láne chabisi.	2. Láne chapsisi.	2. Láne chamnisi.
3. Láne chabimi.	3. Láne chapsimi.	3. Láne chamnimi.

Third person.

1. Láne chaba.	1. Láne chapse.	1. Láne chamme.
2. Láne chabasi.	2. Láne chapsesi.	2. Láne chammesi.
3. Láne chabami.	3. Láne chapsemi.	3. Láne chammemi.

Preterite.

First person.

1. Láne chaptong.	1. Láne chaptasa, incl. Láne chaptasuku, excl.	1. Láne chaptayo, incl. Láne chaptako, excl.
2. Láne chaptongsi.	2. Láne chaptasasi, incl. Láne chaptasukusi, excl.	2. Láne chaptayosi, incl. Láne chaptakosi, excl.
3. Láne chaptongmi.	3. Láne chaptasami, incl. Láne chaptasukumi, excl.	3. Láne chaptayomi, incl. Láne chaptakomi, excl.

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* Compare chap-cho, chap-po, chab-u, chab-i, chab-a, chap-tong, cham-i with bré-cho, bré-to, brét-u, brét-i, brét-a, brét-tong, bre-ti; and observe in regard to the former that its radical p becomes b before a vowel and m before a nasal (n. m), but remains p before a sibilant or hard dental. It is so in all transitives in po, of all which chappo is a perfect sample.

Second person.

1. Láne chapteu.	1. Láne chaptasi.	1. Láne chaptani.
2. Láne chapteusi.	2. Láne chaptasisi.	2. Láne chaptanisi.
3. Láne chapteumi.	3. Láne chaptasemi.	3. Láne chaptanimi.

Third person.

1. Láne chapta.	1. Láne chaptase.	1. Láne chaptame.
2. Láne chaptasi.	2. Láne chaptasesi.	2. Láne chaptamesi.
3. Láne chaptami.	8. Láne chaptasemi.	3. Láne chaptamemi.

INFINITIVE.

Láne chapcho.

Participles.

1st in "ba," Láne chapba.
2nd in "chome," Láne chapchome. } Impersonal as before.
3rd in "na," Láne chamna.
4th in "me," Láne chabume, &c.
5th in "me," Láne chaptongme, &c. } Personated and formed by adding "me" to the tense forms.

Gerunds.

1st in "na," Láne chabuna, &c.
2nd in "na," Láne chaptongna, &c.
3rd in "ko," Láne chabuko, &c.
4th in "ko," Láne chaptongko, &c. } Personated all and constructed as before by adding na, or ko, to the several tense forms. The impersonate past gerund is Láne chapso or chapsomami.

Middle Voice.

Lána chamso, and so on, precisely as in the verbs to eat and to summon.

PASSIVE VOICE.

Imperative Mood.

1. Láne chămyi.	1. Láne chapsiki.	1. Láne chapki.
2. Láne chamyisi.	2. Láne chapsikisi.	2. Láne chapkisi.
3. Láne chamyini.	3. Láne chapsikini.	3. Láne chapkini.

Indicative present.

First person.

1. Láne chamyi.	1. { Láne chapso, incl. Láne chapsiki, excl.	1. { Láne chapso, incl. Láne chapki, excl.
2. Láne chamyisi.	2. { Láne chapsosi, incl. Láne chapsikisi, excl.	2. { Láne chapsosi, incl. Láne chapkisi, excl.
3. Láne chamyimi.	3. { Láne chapsomi, incl. Láne chapsikimi, excl.	3. { Láne chapsomi, incl. Láne chapkimi, excl.

Second person.

1. Láne chamye.	1. Láne chapsi.	1. Láne chamni.
2. Láne chamyesi.	2. Láne chapsisi.	2. Láne chamnisi.
3. Láne chamyemi.	3. Láne chapsimi.	3. Láne chamnimi.

Third person.

1. Láne chaba.	1. Láne chabasi.	1. Láne chabami.
2. Láne chapse.	2. Láne chapsesi.	2. Láne chapsemi.
3. Láne chamme.	3. Láne chammesi.	3. Láne chammemi.

Preterite.

First person.

1. Láne chapti.	1. { Láne chaptaso, incl. / Láne chaptasiki, excl.	1. { Láne chaptaso, incl. / Láne chaptaki, excl.
2. Láne chaptisi.	2. { Láne chaptasosi. / Láne chaptasikisi.	2. { Láne chaptasosi. / Láne chaptakisi.
3. Láne chaptimi.	1. { Láne chaptasomi. / Láne chaptasikimi.	3. { Láne chaptasomi. / Láne chaptakimi.

Second person.

1. Láne chapte.	1. Láne chaptasi.	1. Láne chaptani.
2. Láne chaptesi.	2. Láne chaptasisi.	2. Láne chaptanisi.
3. Láne chaptemi.	3. Láne chaptasimi.	3. Láne chaptanimi.

Third person.

1. Láne chapta.	1. Láne chaptasi.	1. Láne chaptami.
2. Láne chaptase.	2. Láne chaptasesi.	2. Láne chaptasemi.
3. Láne chaptame.	3. Láne chaptamesi.	3. Láne chaptamemi.

Infinitive.

It is wanting as in all the passives.

Participles.

1st in "ba," wanting.
2nd in "chome," Láne chapchome.
3rd in "na," Láne chamna.
4th in "me," Láne chamyime, &c.
5th in "me," Láne chaptime, &c.

Gerunds.

1st in "na," Láne chamyina, &c.
2nd in "na," Láne chaptina, &c.
3rd in "ko," Láne chamyiko, &c.
4th in "ko," Láne chaptiko, &c.

Remark.—The precedent in given in full, 1st, because it affords a sample of transitives, in "po:" 2nd, because it demonstrates that these so-called moods are merely compound verbs which (like the case signs) can be multiplied ad infinitum, but have little to do with grammar.

Duty, necessity; I must, or ought.

It is expressed by the impersonal use of the verb dyúm to become, put after the main verb in the regular infinitive with the separate objective pronoun preceding both.

Imperative wanting.

Indicative Mood.

Singular.	*Dual.*	*Plural.*
Gó lácho dyum.*	{ Gósi lácho dyum, incl. / Gósuku lácho dyum, excl.	{ Góyi lácho dyum. / Góku lácho dyum.

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* Quasi mihi ire fit, i. e. decet vel necesse est, in Khas, manlai janu parcha.

Second person.

Ga lácho dyum.	Gasi lácho dyum.	Gani lácho dyum.

Third person.

Harem lácho dyum.	Haremdausi lácho dyum.	Haremdau lácho dyum.

Preterite.

First person.

Gó lácho dyumta.	Gósi lácho dyumta. Gósuku lácho dyumta.	Góyi lácho dyumta. Góku lácho dyumta.

Second person.

Ga lácho dyumta.	Gasi lácho dyumta.	Gani lácho dyumta.

Third person.

Harem lácho dyumta.	Haremdausi lácho dyumta.	Haremdau lácho dyumta.

Optative Mood.

Wish, desire.

Indicative present.

First person.

Singular.	*Dual.*	*Plural.*
1. Wa lála dwáng.	Isi lála dwáng, incl. Wasi lála dwáng, excl.	Íke lála dwáng. Wake lála dwáng.

Second person.

2. Í lála dwáng.	Ísi lála dwáng.	Íni lála dwáng.

Third person.

3. Á lála dwáng.	Ási lála dwáng.	Áni lála dwáng.

Preterite.

1. Wá lála dwakta.	Ísi lála dwakta, incl. Wasi lála dwakta, excl.	Íke lála dwakta, incl. Wake lála dwakta, excl.
2. Í lála dwakta.	Ísi lála dwakta.	Íni lála dwakta.
3. Á lála dwakta.	Ási lála dwakta.	Áni lála dwakta.

Formed of the conjunct possessives, of lála, a verbal noun from lá, to go, and of dwáng, dwakta, the 3rd person of the intransitive dwakko, to be desirous, present and preterite used impersonally.

Precative Mood.

Oh! that I might go.

Let me go.

Imperative.

Singular.	*Dual.*	*Plural.*
1. Lácho gíyi.	1. Lácho gísiki.	1. Lácho gíki.
2. Lácho gíyisi.	2. Lácho gísikisi.	2. Lácho gíkisi.
3. Lácho gíyini.	3. Lácho gíkisi.	3. Lácho gíkini.

Indicative present.

First person.

1. Lácho gíyi.	1. Lácho gíso. Lácho gísiki.	1. Lácho gíso. Lácho gíki.
2. Lácho gíyisi.	2. Lácho gísoki. Lácho gisikisi.	2. Lácho gísosi. Lácho gíkisi.
3. Lácho gíyimi.	3. Lácho gísomi. Lácho gísikimi.	3. Lácho gísomi. Lácho gíkimi.

And so on conjugating the transitive gíwo, to give, in the passive voice, like the passive of jáwo, to eat aforegone. Lácho gíyi = let me go, give me to go. But observe that in order to say let *him* go, you must use the active voice, as below.

Singular.

Let me go, lácho gíyi.
Let him go, lácho gíwo.

Dual.

Let us two go, lácho gísiki.
Let them two go, lácho gíwosi.

Plural.

Let us all go, lácho gíki.
Let them all go, lácho gíwomi.

Remark.—If to these forms we add those of the middle voice. S. Lácho gíso. D. Lácho gísche. P. Lácho gísine, we have a good clue to the character of the three voices in this language which are based upon the idea of me, the speaker, being the exponent of the passive; of self, the spoken to, being that of the middle; and of him, or her, or it, the spoken of, being that of the active voice, Gí-wo = give him: Gí-so = give thyself: Gí-yi = give me, are respectively the starting points of the active, middle and passive voices.

Interrogative Mood.

It resembles the indicative, lágná I shall go, or shall I go?

Prohibitive and Negative Mood.

There is no separate form of the negative verb as in Dravidian tongues, nor even any prohibitive particle distinct from the negative.

Má prefixed expresses verbal negation and prohibition and also nominal privation, e. g. Má jáwo, eat not. Má jágna, I do not eat. Má neuba, not good = bad.

Inceptive Mood.

It is formed by subjoining to the ordinary infinitive form (cho) of the main verb, the subsidiary intransitive verb prénso, to begin, or the transitive páwo, to do, to make: e. g. túcho páwo, begin to drink; túcho papta, he began to drink: jácho prénso, begin to eat; jácho, prensigna, I begin to eat.

Finitive Mood.

It is formed as above, but substituting for páwo or prénso the transitive theumo (conficio), e. g. jácho theumo, finish eating, jácho theumtong, I have done eating. Sometimes "ne,"* replaces the infinitival "cho" of the main verb.

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* The infinitival sign varies, not always intelligibly. Where purpose is meant "tha" is the sign, as játha láti, I went to drink, i. e. for the purpose of drinking. Where commencement and end are expressed, "ne" is more frequent than "cho" jáne prénsigna, jáne theumu, I shall begin to eat, and I shall have done eating. So also where wish is expressed jáne dwaktong, I wished to eat. But cho is the common form and always used alone, as Jácho má jácho ágyem neu, which is better to eat or not to eat.

N. B.—The neuters ryipo (desino) and dyumo (fio), to be ended or to end cannot be used in this way and prénso, to be begun or to begin (self) is much rarer in such use than páwo. Ryipcho páwa is, it nears its end, literally it makes to an end, or to be ended.

Continuative Mood.

It is formed by adding sógno (sense doubtful) to the root of the main verb and therewith conjugating the intransitive verb bwakko, to remain (see conj. III.), e. g. continue eating, jásogno bwakko. N. B.—The definite present and past are also thus expressed.

Imperative.

Singular.	*Dual.*	*Plural.*
Jáso-gno bwakko (eat continuously or keep eating.	Jáso-gno bwakse incl.	Jáso-gno bwangne.

Indicative present.

	First person.	
Jáso-gno bwanggna.	Jásogno bwaksa, incl. Jásogno bwaksuku, excl.	Jásogno bwangya. Jásogno bwakka.
	Second person.	
Jasogno bwangye.	Jasogno bwaksi.	Jasogno bwangni.
	Third person.	
Jasogno bwang.	Jasogno bwakse.	Jasogno bwamme.*

Preterite.

	First person.	
Jasogno bwakti (I ate continuously or I was eating,	Jasogno bwaktasa, incl. Jasogno bwaktasuku, excl.	Jasogno bwaktayo. Jasogno bwaktako.
	Second person.	
Jasogno bwakte.	Jasogno bwaktasi.	Jasogno bwaktani.
	Third person.	
Jasogno bwakta.	Jasogno bwaktase.	Jasogno bwaktame.

Infinitive.

Jasogno bwakcho.

Participles.

1st in ba, Jasogno bwakpa (ba). (Surd requires surd).
2nd in chome, Jasogno bwakchome.
3rd in na, Jasogno bwangna.
4th in me, Jasogno bwanggname, &c. 11 forms, ut supra.
5th in me, Jasogno, bwaktime, &c. ditto ditto.

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* Observe the change of the radical k into ng and m, bwak-ko, bwang-gna, bwam-me. It is constant in all verbs neuter in "ko."

Gerunds.

1st in na, Jasogno bwanggnana, &c. 11 forms.
2nd in na, Jasogno bwaktina, &c. ditto.
3rd in ko, Jasogno bwanggnako, &c. ditto.
4th in ko, Jasogno bwaktiko, &c. ditto.

Remark.—The above is given in full as an exemplar of intransitives in "ko." The transitives of the same conjugation (III.), have the like *euphonic* changes, and for the rest their conjugation may be determined by analogy with the help of the premises already supplied. The indicative present singular alone varies and that is set down in the classification of verbs. The radical "k" becomes "g" in the active voice, and "ng" in the passive and causal, e. g. pók-ko, póg-u, póng-yi, póng-páto.

Iterative Mood.

Raise repeatedly, pókko, mókho, bwákko.

It is formed by adding to the imperative of the main verb, whether transitive or intransitive, the word mókho (sense unknown) and to it subjoining the verb bwakcho, to remain, as in the last mood to which this is very nearly allied in sense. There however we have compound conjugation according to the sense of the primary and secondary verbs which are both conjugated with mókho, immutable, between them. e. g.

Ípo mókho bwákko, sleep repeatedly.	Pókko mókho bwákko, raise repeatedly.
Ímgna mókho bwanggna, I sleep repeatedly.	Pógu mókho bwanggna, I raise repeatedly.
Ípti mókho bwakti, I slept repeatedly.	Póktong mókho bwakti, I raised repeatedly.

And so on through the whole of the intransitive conjugation in "po" (VI.) and of the transitive in "ko" (III.) The definite sense of the present and preterite. I am sleeping, I was sleeping, I am raising, I was raising, is likewise thus expressed.

Conjugation with auxiliar substantive verb and participle.

Of the 4 substantive verbs, ká, khé, gnó, and bwá, the three first express essence and entity; the last, presence, being in a certain place, corresponding respectively to the Khas ho and cha, and to the Newári kha and du, or chóna. Of the Báhing 4 the last or bwá is alone used as an auxiliar and it is compounded with the (apparent) participle or gerund aforegone, or jasogno to procure, definite present (or future) and past tenses of any and every verb in the manner there seen, e. g. písogno bwanggna, I am coming: písogno bwakti, I was coming: teupsogno bwanggna, I am beating: teupsogno bwakti, I was beating.

Remark.—Jásógno, which gives the continuative and the definite form of the tenses above, seems to spring from the impersonal past gerund in "so," jaso vel jasomami. But that is not clear, though it *be* so that, whatever else jasogno is, it is a form of every verb useable with the auxiliar in conjugation.

Jásogno bwanggna = I am eating.

Jásogno bwakti = I was eating.

Písogno bwanggna = I am coming.

Písogno bwakti = I was coming.

Brésogno bwanggna = I am summoning.

Brésogno bwakti = I was summoning.

Compound verbs with each element conjugated.

Jwagdíwo, to arrive.*

Imperative Mood.

Singular.	*Dual.*	*Plural.*
Jwagdíwo.	Jwagdíse.	Jwagdíne.

Indicative present.

First person.

Singular.	*Dual.*	*Plural.*
Jwanggnadígna.	Jwaksadísa, incl. Jwaksudísuku, excl.	Jwangyadíya. incl. Jwakkadíka, excl.

Second person.

Jwanggnedíye.	Jwaksidísi.	Jwangnidíni.

Third person.

Jwangnidí.	Jwaksedíse.	Jwangmedíme.

Preterite.

First person.

Jwaktidíti.	Jwaktasadítasa. Jwaktasudítasuku.	Jwaktayodíntayo. Jwaktakodíntako.

Second person.

Jwaktedite.	Jwaktasidítasi.	Jwaktanidíntani.

Third person.

Jwaktadíta.	Jwaktasedítase.	Jwaktamedímtame.

Infinitive Mood.

Jwakchodícho.

Participles.

1st in ba, Jwakpadíba.
2nd in chome, Jwakchodíchome, &c.
3rd in na, Jwangnadína, &c.
4th in me, Jwanggnamedígname, &c.
5th in me, Jwaktimedítime, &c.

Gerunds.

Impersonal of the present. None.
Impersonal of the past.
Jwaksomamidísomani or Jwaksodíso.

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* Jwákko, is an intransitive in "ko" meaning to arrive, and it can be conjugated separately; but, with that love of specialization which is so characteristic of Kiranti verbs, it is always used in conjunction with the verb to come (píwo) or to go (díwo). Jwagdíwo as a single word can be also so conjugated. The remarkable thing is that each verb of the compound can be conjugated.

Personated Gerunds.

1st, Jwanggnadígnana, } present.
2nd, Jwaktidítina, }

3rd, Jwanggnadígnako, } past.
4th, Jwaktadítako, }

*Causal Verbs.**

All verbs whatever can be made causal by adding to their root the transitive verb páto, from pa† to do or make. But pá makes its regular transitive in "wo," páwo. Páwo is do; páto, do for him, on his behalf; and this leads me to observe that every transitive verb, save those in "to," has the following six forms.

1. Teupo, strike him, active transitive in "po."
2. Teum-so, strike thyself, reflex transitive, or middle in "so."
3. Teum-yi, strike me, paasive in "i."
4. Teup-to, strike it for him, active transitive in "to."
5. Teum-so, strike it for thyself, middle in "so."
6. Teupti, strike it for me, "passive in "ti."

So also pá, to do, has pá-wo, páso, páyi; páto, páso and pati: and kwó, to see, has kwógno, kwóso, kwóyi; kwoto, kwoso and kwoti: and pok, to raise has pokko, pokso. pongyi; pokto, pokso, pokti; and in like manner every other transitive, except those in "to" as the primary form. It is the secondary form of the transitive of the verb to make, or páto, which is used for constructing causals, but yet it takes the passives in "i," not "ti," when thus employed, though, when used separately, it assumes its regular form in "ti"—an anomaly, like that of the use of the reflex or middle voice in one form and two senses (2.5).

But besides the regular causal formed by páto added to the root of the main verb (e. g. kwopáto, cause to see), there are other means of constructing causals which shall be first mentioned before proceeding to exhibit the conjugation of the former.

These means are, 1st the hardening of the initial consonant of an intransitive, as—

Dokko, fall.	Tokko, cause to fall.
Dyúmmo, become.	Thyúmmo, cause to become.
Gúkko, be crooked.	Kúkko, crooken or make crooked.

---

* Besides its ordinary use, the causal form of the verb is frequently used, especially in its middle voice, as a passive. Thus, jápáso is, be thou eaten, or suffer thyself to be eaten, implying voluntariness on the part of the patient; and so bémpáso is let thyself be kissed. All three voices, however, can be used thus and frequently are so, whenever the complex pronomenalization of the primary verb causes embarrassment. The passive use of the causal is very common in Himalaya, and is often, as in Newári, the only substitute for a passive. This is not wonderful in so crude a tongue as Newári: it is so, however, in the Kiranti language which possesses the great secret of the most refined conjugation in its neat personal suffixes and its power of euphonic compounding. Owing however to too much attention to the agents, and too little to the action, the Kiránti verb with all its constructive richness on one side, shows equal poverty on another, and hence the passive use of the causal form.

† The root pá, pí in Váyu, an allied Himalayan tongue, is the same as the Dravidian causative.

Gíkko, be born.	Kíkko, beget or give birth to.
Jíto, be born.	Chíto, tear.
Bokko, get up.	Pokko, raise, or make get up.
Bukko, be burst.	Pukko, burst.

2nd, by dropping the intransitive sign whatever it be, and substituting the transitive sign in "to," or "ndo" (do).

Píwo, come.	Píto, bring.
Ráwo, come.	Ráto, bring.
Díwo, go.	Díto, take away.
Láwo, go.	Láto, take away.
Kúwo, come up.	Kúto, bring up.
Yúwo, come down.	Yúto, bring down.
Dwakko, be desirous or long.	Dwakto, desire it, or long for it.
Túgno, drink.	Túndo, cause to drink.
Wogno, issue.	Wondo, extract.
Glúgno, enter.	Glúndo, insert.
Cháyinso, learn.	Cháyindo, teach, i. e. cause to learn.
Níso, sit.	Níto, set down.
Khleuso, lie hid.	Khleundo, hide it.

I need not point out what an important analogy with the Dravidian tongues the first (nay, both) of these two processes presents, but I may add that this analogy is in perfect keeping with the further habit of this Himálayan language of hardening or doubling the indicative present sign by way of making a preterite, as

Myelda, he is sleepy.	Myelta, he was sleepy.
Sáda, he kills.	Sáta, he killed.
Kwáda, he puts on the fire.	Kwáta, he put on the fire.
Gramda, he hates.	Gramta, he hated.
Teuba, he strikes.	Teupta, he struck.
Bréta, he summons.	Brétta, he summoned.
Khleuta, he conceals.	Khleutta, he concealed.
Soda, he tells it.	Sotta, he told it.

Add to these analogies the common habit of Báhing and Támil of annexing the conjugational sign to the imperative and that that sign is indifferently applied to intransitives and transitives (leaving the style of the indicative to difference them); and further that the conjunct pronomenalization of their verbs and nouns is by prefixing in regard to the nouns and suffixing in regard to the verbs,* not to mention several other analogies cited in the sequel, and Messrs. Muller and Caldwell will find it difficult to maintain their assertion that there is nothing Dravidian in the structure of the Himálayan tongues!

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* Teub-u, I strike	Wa popo, My uncle.	*Remark.*—Wa, i, a, the pronominal adjuncts are perfectly distinct from the separate pronouns; and, wa being = u, the adjuncts of verb and noun tally to identity. Here, then, is the alleged diagnosis of Dravidianum more fully developed than in any Dravidian tongue.
Teub-i, Thou strikest	I popo, Thy uncle.	
Teub-a, He strikes	A popo, His uncle.	
Pog-u, I raise	Wagu, My hand.	
Pog-i, Thou raisest	I gu, Thy hand.	
Pog-a, He raises	A gu, His hand.	
Bret-u, I summon	Wa daubo, Myself.	
Bret i, Thou summon'st	I daubo, Thyself.	
Bret-a, He summons	A daubo, Hisself.	

Many verbs, identical in form, in the imperative yet differ in sense as Khiwo, n. tremble and khíwo, a. quarrel, úto, n. fall; úto, a. fell. Many, again, materially change their sense in passing into the causal or transitive form from the intransitive or neuter; and, lastly, the causal form of neuters and of transitives, though very generally of the normal construction in páto added to the root (ipo, sleep; impáto, cause to sleep), yet in the case of many verbs of both sorts in "po" and in "gno," is not so, the alteration being effected by changing their sign into the transitive "to" vel "do" sign, as ipo, sleep; ipto, cause to sleep (a synonyme of impáto); túgno, drink, túndo, (= túpáto) cause to drink. When the sense is much altered in such transition, the derivative causal of a neuter is constantly regarded as an independant word and primitive verb, and the neuter takes the normal causal form, thus láwo, n. = go, has láto for its causal: but, láto being used to signify take away, lápáto is made to express the precise sense of cause to go.

All this shows, when taken in connexion with the general transformability of all transitives not primitively in "to" into that form, the pre-eminent transitive and preterite character of that widely diffused sign.

It also shows how apt causal is to be equivalent to transitive—another widely prevailing Turanian trait, and one harmonising with the almost identity of neuter and intransitive. And here we may remark another special characteristic common to the Himálayan and Dravidian tongues, viz. double causation. Thus in Báhing (and it is the same in many others of our tongues) ipo, sleep, impáto, cause to sleep; impápáto, cause to cause to sleep. Gikko, be born; Kikko or Gingpáto, cause to be born; Kingpáto or Gingpapáto, cause to cause to be born; to which we may add, Kingpápáto expressing causation in the *third* degree from the primitive gikko: and the like holds good with regard to every neuter undergoing a similar change with Gikko.

I proceed now to exhibit an exemplar of the normal causative form of verbs, taking the instance of the verb to eat. Root, Já. Causal transitive, Jápáto. Causal reflex, Jápáso. Causal passive, Jápáyi. The prefixed root does not affect the grammatical form of the auxiliars save as above stated. Páto therefore in this combination will afford a sample of all transitives in "to" which change the "t" into "d." Of the unchanging transitives in "to" I have given a model in Bréto. I shall here give Páto in full in its combination with Já, as a sample of the changing conjugation in "t" (see conjugation X.) merely premising that páso, as an intransitive in "so" (see conjugation XIII.) and páyi as a passive in "i" (yi to keep the vowels apart merely)* have already been given in full, as also the passive in "ti," (vide Breto).

Paradigm of a causal verb.

Active Voice.

Imperative Mood.

Singular of Agent.	*Dual of Agent.*	*Plural of Agent.*
1. Jápáto.	1. Jápáse.	1. Jápáne.
Dual of Object.	*Dual of Object.*	*Dual of Object.*
2. Jápátosí.	2. Jápásesi.	2. Jápánesi.
Plural of Object.	*Plural of Object.*	*Plural of Object.*
3. Jápátomi.	3. Jápásemi.	3. Jápánemi.

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* M also requires the y, for example, teum-yi, strikes me he or thou, = I am struck, see remarks aforegone. It is because the *agent* may be he *or* thou (any one) in the passive, that the passive runs so near parallel with the 2nd *special* form of the verb.

Indicative Mood.

Present and Future Tense.

First person.

Singular.	*Dual.*	*Plural.*
1. Japadu.	1. Jápása, incl. Jápasúkú, excl.	1. Jápáva, incl. Jápáka, excl.
2. Jápádusi.	2. Jápásasi, incl. Jápásúkúsi, excl.	2. Jápáyosi, incl. Jápákosi, excl.
3. Jápádumi.	3. Jápásami, incl. Jápásúkúmi, excl.	3. Jápáyomi, incl. Jápákomi, excl.

Second person.

Singular.	*Dual.*	*Plural.*
1. Jápádi.	1. Jápási.	1. Jápáni.
2. Jápádisi.	2. Jápásisi.	2. Jápánisi.
8. Jápádimi.	3. Jápásimi.	3. Jápánimi.

Third person.

Singular.	*Dual.*	*Plural.*
1. Jápáda.	1. Jápáse.	1. Jápáme.
2. Jápádasi.	2. Jápásesi.	2. Jápámesi.
3. Jápádami.	3. Jápásemi.	3. Jápámemi.

Preterite.

First person.

Singular.	*Dual.*	*Plural.*
1. Jápátong.	1. Jápátasa, incl. Jápátasuku, excl.	1. Jápátayo, incl. Jápátako, excl.
2. Jápátongsi.	2. Jápátasasi, incl. Jápátasukusi, excl.	2. Jápátayosi, incl. Jápátakosi, excl.
3. Jápátongmi.	3. Jápátasami, incl. Jápátasukumi, excl.	3. Jápátayomi, incl. Jápátakomi, excl.

Second person.

Singular.	*Dual.*	*Plural.*
1. Jápáteu.	1. Jápátasi.	1. Jápátani.
2. Jápáteusi.	2. Jápátasisi.	2. Jápátanisi.
3. Jápáteumi.	3. Jápátasimi.	3. Jápátanimi.

Third person.

Singular.	*Dual.*	*Plural.*
1. Jápáta.	1. Jápátase.	1. Jápátame.
2. Jápátasi.	2. Jápátasesi.	2. Jápátamesi.
3. Jápátami.	3. Jápátasemi.	3. Jápátamemi.*

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* Observe for a moment the singular neatness, euphony and precision of these forms. The single words Jápátamesi and Jápátamemi must be rendered into English by they all fed them two and they all fed them all; into Newári, by amisang, aminihma yata nakala, and amisang amita nakala. And, but for the happy term to feed in English, the distinction would be greater still. In Khas the equivalents are, uni heru le ú uwi lai khuwaiyo and uni heru le ú heru lai khuwaiyo or six words for one!

Infinitive Mood.

Jápácho, aoristic as usual.

Participles.

1st in ba, Jápába, who feeds or will or did feed.

2nd in chome, Jápáchome, feedable, whom or with what any one feeds or will feed.

3rd in na, Jápána, fed, whom or with what any one has fed.

4th in me, Jápádume, &c. 33 forms. Feedable by me; whom or with what I feed or will feed, &c.

5th in me, Jápátongme, &c. 33 forms. The fed of me; whom or with what I fed, &c.

N. B.—1—3 are impersonal, as before: 4—5 are personated.

Gerunds.

Impersonated of the present and future. None.
Impersonated of the past, Jápáso, or Jápásomami.

Personated present.

1st in na, Jápáduna, &c. 33 forms.
2nd in na, Jápátongna, &c. 33 forms.

Personated past.

1st in ko, Jápádúko, &c. 33 forms.
2nd in ko, Jápátóngko, &c. 33 forms.

Specimen of the Kiránti language (Báhing dialect).

Kwóng múryeu hópo ke di brétha látá. Gyékhopáso brétha dáyána. Wa khyim di kwóng múryeu, rásogno bwaktako, wa ming nung dwángmóse. Gó harem gyánaiyo má tágna, syú, syú. Íke nyau ásra jajulso, myem sícho, láma, dáso, binti* pápta.

Mokoding hópomi harem kwóng rí nyúba gyáwa dyampattame sísi giptako chyanta, yem sísi í ming giptako, syúyo má giwo, dáso, lópáso, gíwo. Hárem múryeumi myem khógno pápta. Hópomi yo chíwacha dau brétamiko chyantámi. Syuke di rínyuba gyáwa rínám, myem rácho.

Mékeding ryamnípo béla* kwósomami ming ke di díta. Myem mingmi wádi rínyúba gyáwa khlyakti giptáko mócho prénsta, mára

* *N. B.*—Nyau, ásra, binti, and béla are Hindi terms having no precise equivalents in the Kiranti tongue; though it would be easy to turn the phrases so as to replace them by pure Kiranti terms I leave them as samples of a process every where going on in the Central Himálaya whose still primitive languages will probably in time become first mixed and then obsolete.

dáyana, wa wancha mi syu (or su) má gíwo mótime bwá. Naka ga wa ram khome bwagne, i kamdi mára khéda syu ke kam di ra data (or móta). Mékeding ryamnípo khyim ding glutana chìwachadaúmi á rí tamtameko, myem simtámeko, hópo ke di chótha dimtame.

Mékeding hópomi á wancha brétako, móta, yem í ryamnipo, dwákti khedda chyáro, dwaktikhedda plyénti gíwo (or plyenotako) dáso dáta.

Translation of the specimen of the Kíránti language (Báhing dialect).

A certain person went to his prince to complain of a man who was in the habit of coming constantly to his house to make love to his wife, but whom he could never contrive to identify. To his sovereign he said, 'relying on your justice, I appeal to you to have this man arrested.' The Rájah thereon gave the petitioner a phial filled with scented oil and said to him, 'give this phial to your wife and caution her at the same time not to give it to any one.' The man did as he was bade and the Rájah, when he was gone, instructed his spies to look after the matter and to seize and bring to his presence any person they might detect coming from the plaintiff's house, whose clothes had the scent of atter.

By and by, the lover finding an opportunity went, as before, to his mistress who rubbed the atter on his clothes and said to him. 'My husband desired me to give this atter to no one, but you are my life, my soul, how should I refuse it to you? If you like it; take it. I can have no other use for it.'

As the lover, thus anointed with atter, thereafter left the house of his mistress the spies of the Rájah who were on the look out for him, seized him and carried him to the Rájah.

The Rájah thereon sent for the woman's husband and said to him, 'this is your wife's lover. If you please, kill him: if you please, let him go.'

B. H. Hodgson.

October, 1857.

On the Váyu tribe of the Central Himálaya.—By B. H. HODGSON, *Esq.*

The Váyus, vulgarly called Háyus, inhabit the central Himálaya, and the central region of that part of the chain.* They are subjects of Nepal, tenanting the basin of the river Kósi between the confines of the great valley of Nepal proper and that point where the Kósi turns southwards to issue into the plains. The Váyus belong to that interesting portion of the Himálayan population which, in the essay adverted to, I have denominated the broken tribes—tribes whose status and condition, relatively to those of the unbroken tribes, sufficiently demonstrates that they are of much older standing in Himálaya than the latter. The Váyus are in an exceedingly depressed condition, gradually passing to extinction probably. Their numbers do not now exceed a few thousands, how many, I have no means of ascertaining.

Their high antiquity and the complex character of their language, give them, especially in connexion with other tribes of Himálaya similarly characterised, very great interest as an element of Himalayan population. They consider themselves as a single people distinct from all their neighbours. Their language, which has no marked dialects, and is quite unintelligible to any but themselves, supports this view. So also does their perfect community of habits and customs, though they recognise certain distinctions among themselves, of no practical importance, but marked by specific designations, of which the chief are Yákúm, Dóphóm, Konsino, Bálung, Phoncho, Kámaléchho, &c.

Bálung, I know, means exorcist in the Váyu tongue; and the other terms probably point to some perhaps now forgotten avocations. At all events they cannot explain the force of the terms.

They have a tradition of a very remote time when they were a numerous and powerful people, but never having had the use of writing, their remote past is too vague for ascertainment, no foreign and cultivated people having ever noticed and recorded their exist-

* See new edition of essay on physical geography of Himálaya now issuing from the press under the auspices of Government.

ence. The religious ideas of the Váyus are extremely vague, nor does their language afford any term for *the* Deity or even for *any* deity though they have, as usual, an exorcist who is their only priest and physician and to whom they look for relief from all those evils which malignant influence, whatever it be, afflicts them with. They are a very inoffensive industrious race employed in the cultivation of the earth. Their use of the plough is noticeable from its rarity in these regions.

As it has been the chief object of this paper to illustrate the highly interesting language* of the Váyus I shall not at present say more of their status, manners and customs than by a reference to their own account of these conveyed in the statement subjoined to the language as a sample thereof and of which translation was there furnished.

But the physical traits of the Váyu are of an importance second only to that of his language, and the following description will help to illustrate them.

Dimensions of a man named Páte, a Váyu of the Yákum caste, aged twenty-eight years, in the service of Captain Gojráj Thápa of Nepál.

Height, ...	5. 0.0
Crown of head to hip, ...	1.11.½
Hip to heel, ...	3. 0.½
Length of arm and hand, ...	2. 2.½
Girth of head, ...	1. 9.0
Girth of arm, ...	0. 9.0
Girth of forearm, ...	0. 9.½
Girth of thigh, ...	1. 6 0
Girth of calf, ...	1. 1.0
Girth of chest, ...	2.11.0

Páte is rather below than above the standard height of his fellows, which may be taken at about five feet three inches. His colour is a

* I meant to have prefaced the details by a few general remarks under the usual heads of article, noun, pronoun, &c. But time runs short and the philological reader will readily apprehend these from the details already given whilst other classes of readers are little likely to pay any attention to the matter.

pure isabelline brown without the least trace of ruddiness in the skin or hair. The eye is dark hazel and the hair long, straight, black, ample on the head, scant every where else.

Vertical view of the head oblate ovoid, rather wider behind than before but not much, and flattish behind.

Bachycephalic. Facial angle very good, the mouth being only moderately salient and the forehead of good height, forwardness and breadth, but the chin defective. Eye-brows even, scantish. No beard or whisker, and a very small moustache. Eyes small, flush with the cheek, oblique, very wide apart, drooping upper lid bent down at the inner angle. Nose rather short, straight, depressed between the eyes, moderately salient elsewhere, broad at end and having large round nostrils. Mouth moderately salient, the peculiar thickening of the upper gum, which chiefly causes the saliency, being not great, and the lips not tumid, only moderately full. Teeth vertically set, strong, white. Chin retiring and small. Zygomœ and cheek bones very salient to the sides and profile flat. Front view of the face squarish, owing to the large angular jaws which are as salient laterally as the zygomœ.

Remark.—This young man's physiognomy is distinguished by the full Turanian breadth of head and face. Two others of his race whom I examined—a man of fifty-eight years and another of thirty years—had not the same breadth nor the same perfectly Kalmac eye. These men measured nearly 5.5.0 and were several shades darker in colour than Páte; and upon the whole I incline to regard them as more normal samples of the race than Páte. In a word, I think that I have sufficient grounds for concluding that the Váyus are in general somewhat darker and of a less decidedly Mongolic cast of countenance than the Lepchas (for example), from whose perfectly Turanian type, they lean towards the Turkic and Dravidian subtypes, which again approach the Arian, and are seen in the Kiránti tribe of Himálaya more clearly and more frequently than in the Váyu tribe.

The elder of the two individuals above adverted to, I was enabled to examine rapidly whilst Mr. Scott photographed him. He was 5.4.½ in height, moderately fleshy and dark brown. Vertical view of the head oblate. Wider and flat behind, greatest breadth between

the ears. Rising pyramidally from the zygomœ to the crown of the head. Facial angle not bad, the forehead retiring and narrowing only slightly, the mouth not being porrect, nor the chin retiring but pointed. Eyes remote, not small, but the upper lids flaccid and somewhat down-curved at the inner canthus. Nose pyramidal, not levelled between the eyes nor the extremity much thickened, but the nares large and round. Mouth large but well fermed, with neatly shaped lips and vertical fine teeth.

The younger man above alluded to was 5.5.0 and as dark as an ordinary native of the plains whom he further resembled in his unflatted, face though his eye wanted the fullness and shapeliness of that of the lowlanders beside whom I placed him.

When placed beside some Dhángars of the Uráon tribe the impression made upon me by a comparison of the whole was, that the physical type is one and the same in the highlanders and lowlanders; that the type is flexible to a large extent; and that the general effect of the northman's residence for ages in the malarious and jungly swamps of the plains is to cause the Turanian type to incline towards the Negro type but with a wide interval from the latter. The Uráon compared with the Váyu has less breadth of head and face, more protuberance of mouth, and a better shaped, larger eye, not down curved next the nose; and it is thus, I conceive, that the Negro type differs from the Turanian.

On the Kiránti tribe of the Central Himálaya.—By B. H. Hodgson, *Esq.*

It has been the main purpose of one of the preceding papers to examine the grammatical structure of the Kiránti language as a second sample of that class of Himálayan tongues (the Váyu tongue, already examined, being the first) which I have elsewhere denominated the pronomenalized or complex.*

The opinion of such scholars as Müller and Caldwell that the Himálayan tongues have nothing Dravidian about them, can thus

* See essay on physical geography of Himálaya and other papers now issuing from the Calcutta press under the auspices of Government.

be tested, and I think shown to be a mistake; and it will be further demonstrated, I trust, by these and other investigations which I hope soon to complete, that the Himálayans are closely connected, as well with the southern as with the northern members of the family of Túr—members by no means so disjoined and dissimilar as it is the fashion to represent them.

As a supplement to the grammatical details, I will now give such a sketch of the Kiránti people, as at present existing in Nepal, as will, I hope, add to the interest and value of the philological portion of my essay.

The Kirántis, on account of their distinctly traceable antiquity as a nation and the peculiar structure of their language, are perhaps the most interesting of all the Himalayan races, not even excepting the Newárs of Nepál proper.

By means of the notices contained in the Classics of the east and west* we are assured that the Kiránti people was forthcoming in their present abode from 2000 to 2500 years back, and that their power was great and their dominion extensive, reaching possibly at one time to the delta of the Ganges. Moreover, the general tenor of these classical notices is confirmed by the Vansávalis or chronicles of Nepál proper which show a long line of Kiránti sovereigns ruling there from the mythic age of the shepherd kings (Gópál) down to the 14th century of our æra. And lastly, these distinct historical data harmonise with a well-known tradition which assigns a very unusual (in these regions) amount of power and population to the "many-tongued" Kiránti. We know not when the Kirántis were expelled from the plains of India; if indeed they ever held permanent possession there. But it was the Mall dynasty of Nepál proper which about the middle of the 14th century expelled them from the great valley; and the Sáhs of the eastern or Vijayapur branch of the Makwánis by whom their independance in the mountains, probably about the same period, was greatly trenched on, whilst the Sáhs of the house of Gorkha, now sovereigns of the modern kingdom of Nepal, completed the subjection of the Kirántis about a century ago.

* See Müller apud Bunsen and Caldwell and lists of castes taken from Menu and the Puránas apud Calcutta Quarterly.

Adverting to the high recorded antiquity of the terms Kirát or Kiránt and Kiráti or Kiránti (vague nasal) as applied respectively to the country and people, even to this hour, it is remarkable that the Kirántis themselves do not readily admit the genuineness or propriety of those terms, but prefer the names Khwombo vel Khombo and Kiráwa as their general personal designations and seem to have none at all for their country. But the Kirántis, always ignorant of letters, have been now for a long time depressed and subdued; and, huddled as they now are into comparatively narrow limits, they are yet divided among themselves into numerous tribes and septs speaking dialects so diverse as not to be mutually intelligible; and hence they are wont to think only of their sectional names and to forget their general or national one.

It is difficult, owing to the varying limits at diverse æras, to ascertain the precise force of the territorial term Kiránt in the view of the people themselves. But the following statement of boundaries, divisions and included septs may, I believe, be considered sufficiently accurate for all present purposes.

Kiránt.

1. Wallo Kiránt or Hither Kiránt.	2. Mánjh Kiránt or Middle Kiránt.	3. Pallo Kiránt or Further Kiránt.
	Respective tribes.	
Yákha.	Bontáva.	Chourasya.
Límbu.	Ródong.	
Lóhorong.	Dungmáli.	
Chhingtáng.	Kháling.	
	Dúmi.	
	Sángpáng.	
	Báláli.	
	Lambichhong.	
	Báhing.	
	Thúlung.	
	Kúlung.	
	Waling.	
	Nachhereng.	

This is Kiránt in the larger sense, and including Khwombuán or Kiránt proper, and Limbuán or the country of the Limbus. The

popular inclusion of the latter people is important and I believe well founded, as also that of the Yákhas, though both are often alleged to be not Kirántis. They are at all events closely allied races, having essential community of customs and manners with the Kirántis, and they all intermarry, nor probably do the dialects of the Limbus and Yakhas differ much more from the Khwombu* tongue, than that tongue now does from itself, as seen in the several dialects of the septs set down above under "Middle Kiránt." The comparative vocabulary already submitted to the Society will go far to decide these questions when taken in connexion with that grammatical analysis of the Limbu tongue which I am now engaged on. The boundaries of Kiránt in its three subdivisions are—

1. Súnkósi to Likhu, 2. Likhu to Árun,	Khwombuan.
3. Árun to Méchi and Singilela ridge,	Limbuan.

Such are the territorial limits of the extant Kiránti race, in the larger sense. Their numbers probably do not now exceed a quarter of a million; but the tradition which I referred to above, assigns two and a quarter millions as the amount of their population at some remote and not well ascertained period when their country was customarily spoken of as the "no lákh kiránt," and the phrase was interpreted to mean that a house tax at two annas per family yielded nine hundred thousand annas, whence, if we allow five souls to a family, we shall obtain two and a quarter millions of people for the Kirántis inclusive of the Limbus and Yakhas, and possibly the Vayus also. The Kirántis occupy the central or healthful region of the mountains, and never descend, to dwell there, into the lowest and malarious valleys of that region. Consequently they are not reckoned among the Awalias or tribes inured to malaria. Nor can they be placed among the broken tribes, great as is their antiquity and devoid as they long have been of political independence, and moreover, allied as they are by the character of their language to the above two sections of the population of Himalaya or the Awalias and the broken tribes, (see Essay referred to above). The Chiefs or kings of the Kirántis were

* Potius Khombu. The intercalated "w" is a dialectic peculiarity of Báhing.

called Hang or Hwang. There are of course none such now nor have been for five centuries. Their village headman they still denominate Pasung, equivalent to Rai in the Khas tongue of their present masters the Gorkhalis. The pasung has still under the Gorkhali dynasty, a good deal of authority over his people. He collects their taxes and adjusts their disputes with but rare reference or appeal to the Rajah's Courts.

Unlike most of the subjects of Nepal, the Kirántis retain possession of the freeholds of their ancestors which they call walikha, and the owner, thangpung hangpa. Each holding is extensive, though not generally available, owing to the high slope of the surface, for the superior sort of culture. The boundaries of an estate are defined by the run of the water. The tax paid to the Government by each landholder or thangpung hangpa (literally, lord of the soil) is 5 rupees per annum, 4 being land tax, and 1, in commutation of the corvée.

The general style of cultivation is that appropriate to the uplands, not the more skilful and profitable sort practised in the level tracts, and, though the villages of the Kirántis be fixed, yet their cultivation is not so, each proprietor within his own ample limits, shifting his cultivation perpetually, according as any one spot gets exhausted.

Arva in annos mutant and superest ager. The plough is sometimes used, but very rarely, and the use of it at all is recent and borrowed, nor has the language any term for a plough. The produce is maize, buckwheat, millets, peas, dry rice and cotton. The general, almost exclusive, status of this people is that of agriculturists. They did not till lately take military or menial service.* They have no craftsmen of their own tribe, but buy iron implements, copper utensils, and ornaments for their women from other tribes, and supply most of their simple wants themselves. The useful arts they practise are all domestic: fine arts they have none, nor ever had: no towns, and only small villages of huts raised obliquely on the outer side on wooden posts some three to six feet, so as to get a level on the slope of the hill: size small because the children separate

* Jang Bahadur has lately raised some Kiránti regiments. He is wise and has seen in time and provided against the risk of a too homogeneous army. The Kirántis have of late freely taken menial service with us in Sikim.

on marriage; walls of thick reed, plastered, and the pent roof of grass. Each family builds for itself. The women spin and weave the cotton of native growth, which constitutes their sole wear, and the men and women dye the clothes with madder and with other wild plants—whereof one, a climber, yields a fine black colour. They make fermented and distilled liquors for themselves, and use the former in great quantities—the latter moderately.

The Kirantis have not, nor ever had, letters or literature.* Their religious notions are very vague. They have no name for the God of gods, nor even for any special deity whatever, though the term mang may be construed deity, and that of khyimmo or khyimmang, household deity or penate. Nor is there any hereditary priesthood, or any class set apart and educated for that office. Whom the mang inspires, he is a priest and his duty is to propitiate the Khyimmang or Penate of each family by an annual worship celebrated after the harvest, and also to perform certain trivial ceremonies at marriages and deaths, but not at births. The priest is named Nakchhong, and he has, moreover, once a year, to make offerings to the manes (samkha) of the ancestors of each householder, or rather, to all the deceased members of each family.

The Kirántis believe heartily in the black art, and call its professor Krakra, Kunyamayawo, &c. The professional antagonist of this formidable person, who undoes the mischief, bodily or mental, which the other had done, who is at once exorcist and physician, is named in the various dialects, Janicha, Mangpa, &c.

There are only two religious festivals per annum, one to the Khyimmo or Penate and the other to the samkha or souls of the deceased.

As already said, birth is not attended by any religious observances.

The Kirántis buy their wives, paying usually 25 to 30 rupees, frequently in the shape of copper household utensils. If they have

* The Limbus, like the Lepchas, have an alphabet seemingly original but neither people has made much use of it. I submitted these alphabets to the native and English scholars of Madras, Ava and Arrakan and was told they could not be traced to any Indo-chinese or Dravidian source. I had priorly received a like disclaimer from the Lamas of Tibet.

no means, they go and earn their wife by labour in her father's family. They marry usually at maturity—nay, almost universally so. Divorce can always be had at the pleasure of either party; but if the wife seek it, she or her family must give back the price paid for her, and all the children will remain with the husband in every event of divorce. The marriage ceremony is as follows. The priest takes a cock in his left hand and strikes it on the back with the blunt side of a sickle till blood flows from its mouth. According as the blood marks the ground, the priest prophesies that the offspring will be boys or girls; and if no blood flow, that the marriage will be childless. This is the essence of what passes and it seals the contract.

The Kirántis bury their dead on a hill top, making a tomb of stones loosely constructed. The burial takes place on the day of decease. The priest must attend the funeral and as he moves along with the corpse to the grave he from time to time strikes a copper vessel with a stick, and invoking the soul of the deceased, desires it to go in peace and join the souls that went before it. The law of inheritance gives equal shares to all the sons, and nothing to the daughters, unmarried or married. Concubines are unknown. Polygamy is allowed and not uncommon. Polyandry unheard of and abhorred.

Tattooing is unknown. Boring of ears and nose common with the women; rare with the men. The hair is usually worn long and so as to hide the Hindu-like top knot that is however always forthcoming. The general character of the Kirántis is rather bad among the other tribes who consider them to be somewhat fierce and prompt at quarrelling and blows, especially in their cups,—a state very frequent with them. But at Darjiling they have now for 15 years borne an excellent character as servants, being faithful, truthful and orderly, so that their alleged fierceness should, I think, be called manly independence; or be referred to their long past days of political independence and martial habits.

I proceed now to the physical character of the tribe. Premising that I have long been habituated to these physical observations, by no means confined to the hills, I would repeat once* more that the

* See Preface to my Essay on Kocch Bodo and Dhimal.

Himalayan type, though upon the whole Mongolian, is not to be judged, (any more than the African one by the negro) by the Kalmak exaggeration of that type; and moreover, that the type exhibits here, as to the north and to the south of us, a large range of variation, indicating, like the lingual type, that the Himalaya has been peopled by successive immigrations of northmen belonging to many, probably to all, of the various subfamilies into which the restless progeny of Túr has been (I think prematurely) divided by European philologists and ethnologists. I think, moreover, that I can discern this sort of accord between the physical and lingual types, to wit, that the tribes with simple languages have more, and the tribes with complex languages have less, of the Mongolian physical attributes, after careful elimination of the presumed effects of mixture of breed (and such facts are always notorious on the spot) where such mixture has taken place. Thus, a Lepcha or Gurung or Magar or Murmi to a simple language unites a palpable Mongolian physiognomy and frame, whilst a Kuswar, Dhimali or a Kiránti with a language much allied to the higher Túrkic, Ugrofinnic and Dravidian type* possesses a face and form tending the same way.

I will now describe my samples, adding, lest I should be supposed to have selected them unfairly, that they are men long in my own service.

Dimensions in English feet and inches.

	(1) *Bontawa*			(2) *Bahing*			(3) *Thulung*		
Total height, ...	5	4	0	5	0	0	5	2	0
Crown to hip, ...	2	5	0	2	2	0	2	3	0
Hip to heel, ...	3	2	0	2	11	0	3	0	0
Fore and aft length of head, ...	0	9	$\frac{1}{8}$	0	8	$\frac{3}{4}$	0	8	$\frac{1}{4}$
Side to side width of Ditto, ...	0	6	0	0	6	$\frac{1}{4}$	0	6	0
Girth of Ditto, ...	1	9	$\frac{1}{4}$	1	9	$\frac{1}{2}$	1	8	0
Breadth of face, ...	0	5	$\frac{1}{8}$	0	5	$\frac{3}{8}$	0	5	$\frac{1}{4}$
Length of arm and hand, ...	2	5	0	2	3	$\frac{1}{2}$	2	4	0
Girth of arm, ...	0	10	0	0	9	$\frac{3}{4}$	0	9	$\frac{1}{4}$
Ditto of fore arm, ...	0	9	$\frac{1}{4}$	0	9	$\frac{3}{4}$	0	10	0

* The complex pronomenalization of the Kiránti verb, points to a special connexion with Muller's Munda subdivision.

Girth of thigh, ...	1	6	0	1	6	0	1	6	$\frac{1}{2}$
Ditto of calf, ...	1	0	$\frac{1}{2}$	1	0	$\frac{1}{2}$	1	0	$\frac{3}{4}$
Girth of chest, ...	2	9	$\frac{1}{2}$	2	10	0	2	10	$\frac{1}{2}$

No. 1. A Bontawa, age 55. Head, long, narrow, vertical view elliptic, equally wide fore and aft, widest between the ears. Front view of the head and face oval, with the cheek bones little protruded and the forehead not narrowing upwards. Profile or side view good, nearly vertical, the mouth not being at all inclined to prognathism, and the forehead very little retiring, but chin somewhat defective. Forehead of good height and breadth, nearly as wide as the cheek bones. Eyes of good size, remote; upper lid flaccid, but hardly perceptibly bent down next the nose. Nose, long, straight, pyramidal, well elevated though thick and with the nostrils elongated, not round. Mouth well formed, not protuberant, of good size and having shapely lips and vertical teeth not at all exposed, chin not retiring but not advanced and rather defective. Jaws, neither heavy, nor square. Colour, a clear light brown, deeper and less olive than usual. No trace of ruddiness. Hair jet black, ample, straight, glossy, strong but not coarse. Moustache, full and jet black. No whisker. Eye-brows scanty and horizontal. No hair on chest. Figure good but trunk and arms long, and legs short. Very moderate development of bone or muscle for a highlander, and scarcely more than in a plainsman.

2. A Bahing, 30 years old. Head broader and shorter, vertical view oblate ovoid, wider behind than before, but not flattened behind. Front view of the face shows (like the head,) more breadth than in No. 1, and is somewhat square owing to the projection of the cheek bones and of the angles of the jaws. Profile, vertical as in the last, with very little saliency of the mouth, a vertical but somewhat narrow forehead, and a chin flush with the front of the jaw. Forehead less fine than in the last, vertical to the front but somewhat narrow or rather seeming so, owing to the lateral projection of the jaws and cheek bones. Eyes of good size remote, showing faintly but distinctly the usual flaccidity and deflexion towards the nose, of the upper lid. Nose, as in the last, long, straight, pyramidal, broad but not depressed. Nostrils large and round. Mouth of good size and shape, with moderately full lips

of which the upper has a tendency to advance more than the lower, owing to the normal thickening of the gum. Teeth fine and vertical and not at all exposed. Chin devoid of the prominent roundness of the part, flush with the jaw in front. Jaws heavy and angular. Colour as in the last, pale ruddy brown, deeper and less dull than the usual isabelline colour. Hair jet black, straight, strong. No whisker. A scanty moustache. Eye-brows full. Chest hairless. No more development of bone or muscle than in the last, and figure, as before, good but noticeable for length of trunk and arms.

No. 3. A Thulung, 22 years old, has the breadth of head and face of the last, vertical view of the head showing great and remarkably uniform width in proportion to length. Profile line vertical, as before, and all the details of the features wonderfully similar, as in a strong family likeness, and figure also and colour.

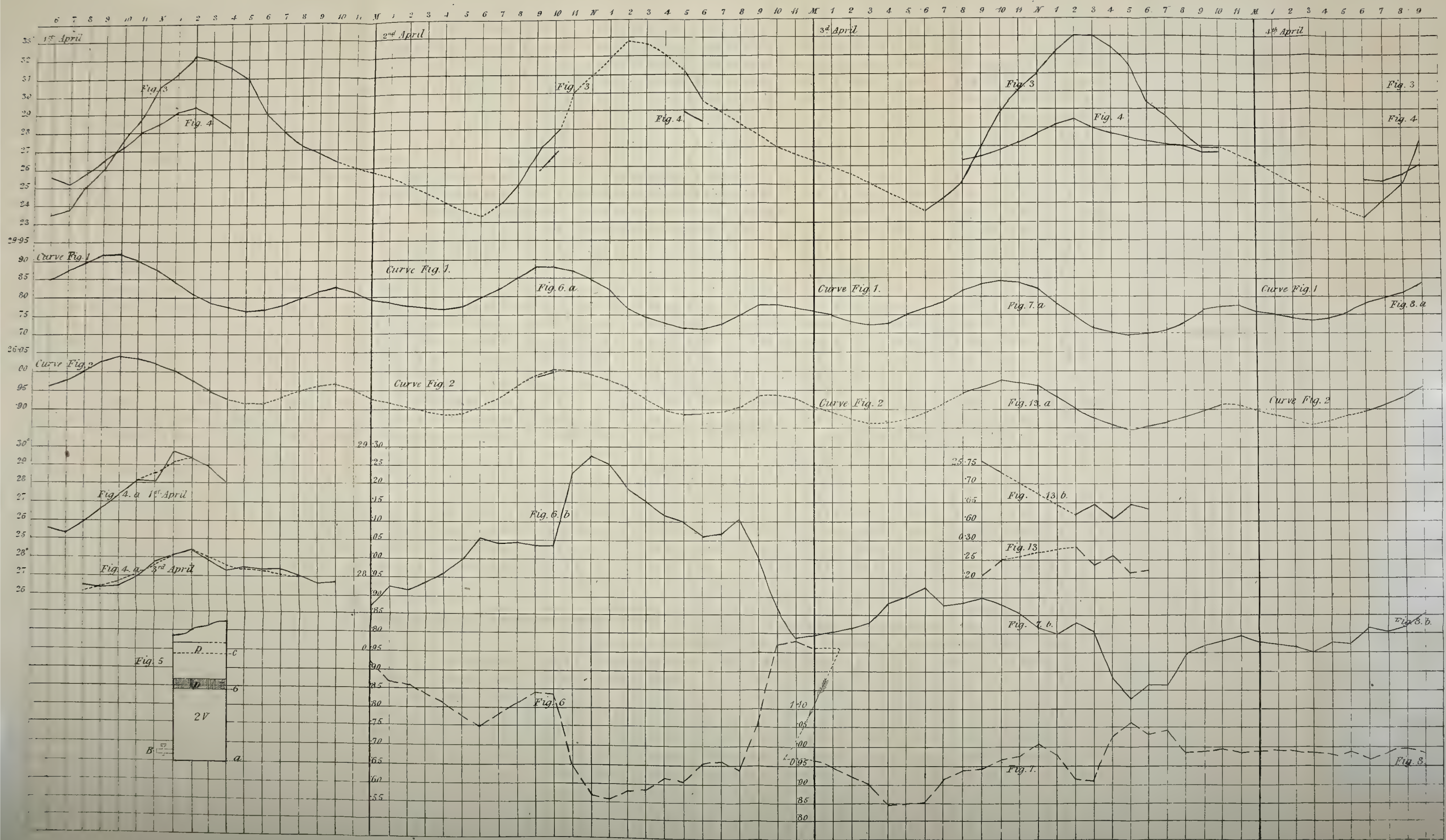
General remark. All these three men have a depth of colour and defect of bone and muscle assimilating them to the lowland Turanians generally and differencing them from the highlanders generally but especially from the Palusen, the Gurung, the Sunwar, the Murmi, the Magar and the Lepcha; and the Bontawa has a head and face carrying on the resemblance with the lowland Turanians and which I believe to be so frequent among the Kirántis as to deserve to be called the rule, not the exception. In conclusion, I may perhaps be permitted to say, as the result of long years of practised observation that the effect, upon the Turanian northmen, of passing from the cold high and dry plateau of " Asie Centrale," down the various steps of the Himalayan ladder into the hot and moist plains of India is to diminish the volume of bony and muscular development, to diminish also the extreme breadth of head and face with the consequent wide separation of all the double organs of sense and to modify the defects of the eye, giving it a freer and straighter aperture and less flaccid upper lid; moreover, that such tribes as, in the throng of successive immigrations, have been broken, barbarized and driven to seek refuge in malarious tracts, seem to manifest a tendency to pass from the low Turanian to the low African or Negro type;*

* Narrowness of head and face, and projection of mouth are the great marks of the Negro type. Now I have an Uráon in my service in whom these marks

and lastly that, after these effects have been produced in the course of numberless ages, it must always be unsafe to dogmatise upon physiological or philological grounds only respecting the *special* relations and characteristics of any given tribe without abiding advertence to the general relations and characteristics of such tribe, and to the proof of both that may be had by carefully seeking out and weighing all the available evidence, whether physiological or philological, moral or traditional.

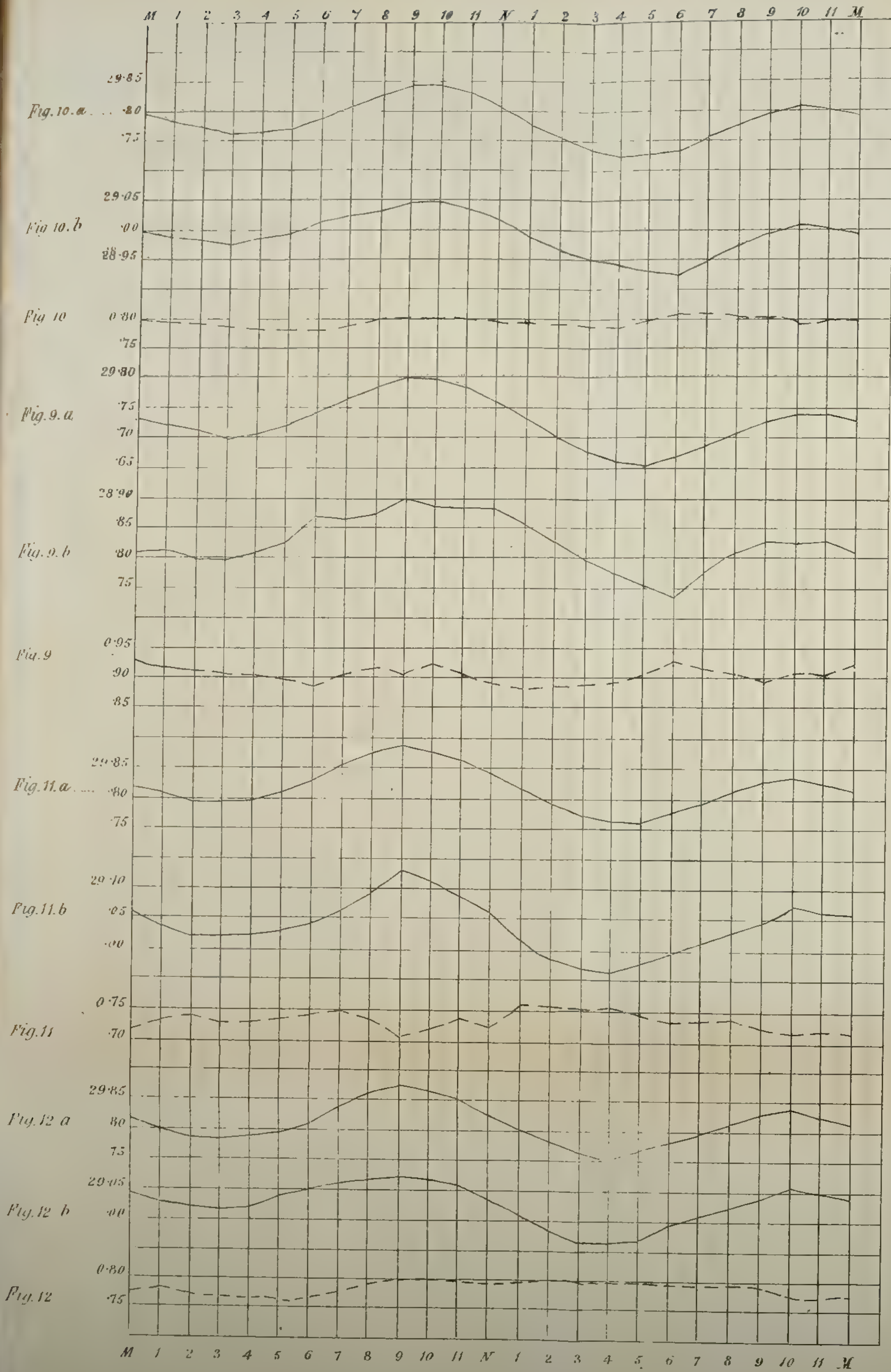
The evidence of any reflux towards the north of the great tide of Turanian population flowing wave after wave over India through the numberless passes of the Himalaya, and also perhaps round the Western and Eastern extremities of the chain, is faint, seeming to be confined to the Newar tribe of Nepal Proper, who have a tradition of their return to Nepal after having reached so far south as Malabar. Nor are there wanting coincidences of arbitrary customs, of the shape and use of agricultural and other implements and of words and grammatical forms to countenance and uphold that tradition, as I have already adverted to in my paper on the Nilgirians.

united to a very dark skin are conspicuous and his lips are very thick and his eye good, and his hair crisply curled, but not at all woolly.



LITHOG BY. H. M. SMITH, SURV. GENL'S OFFICE, CALCUTTA, JANUARY 1858

Plate II.



LITHOG. BY H. M SMITH, SURV GENL'S OFFICE, CALCUTTA JANUARY, 1858.

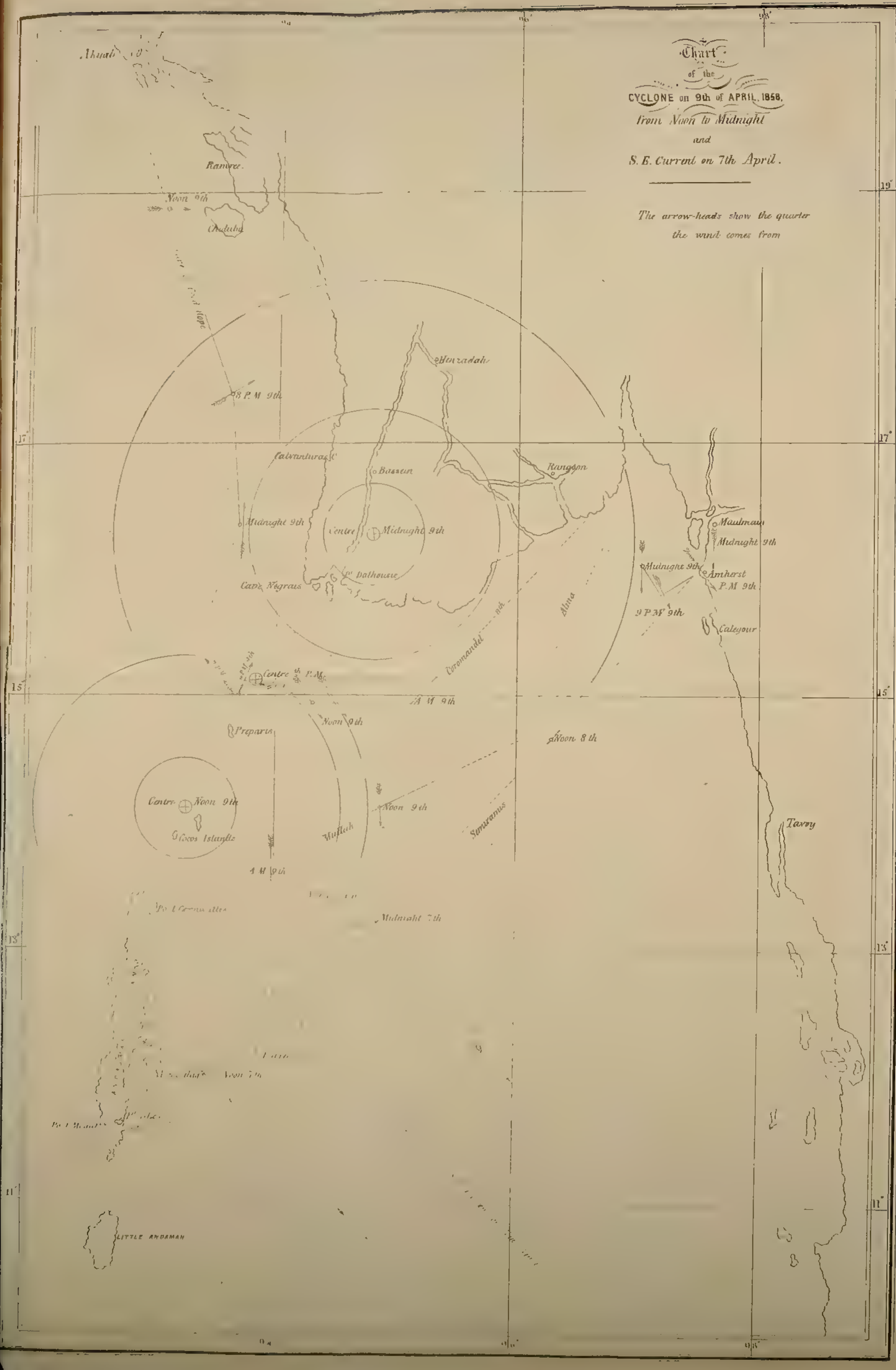
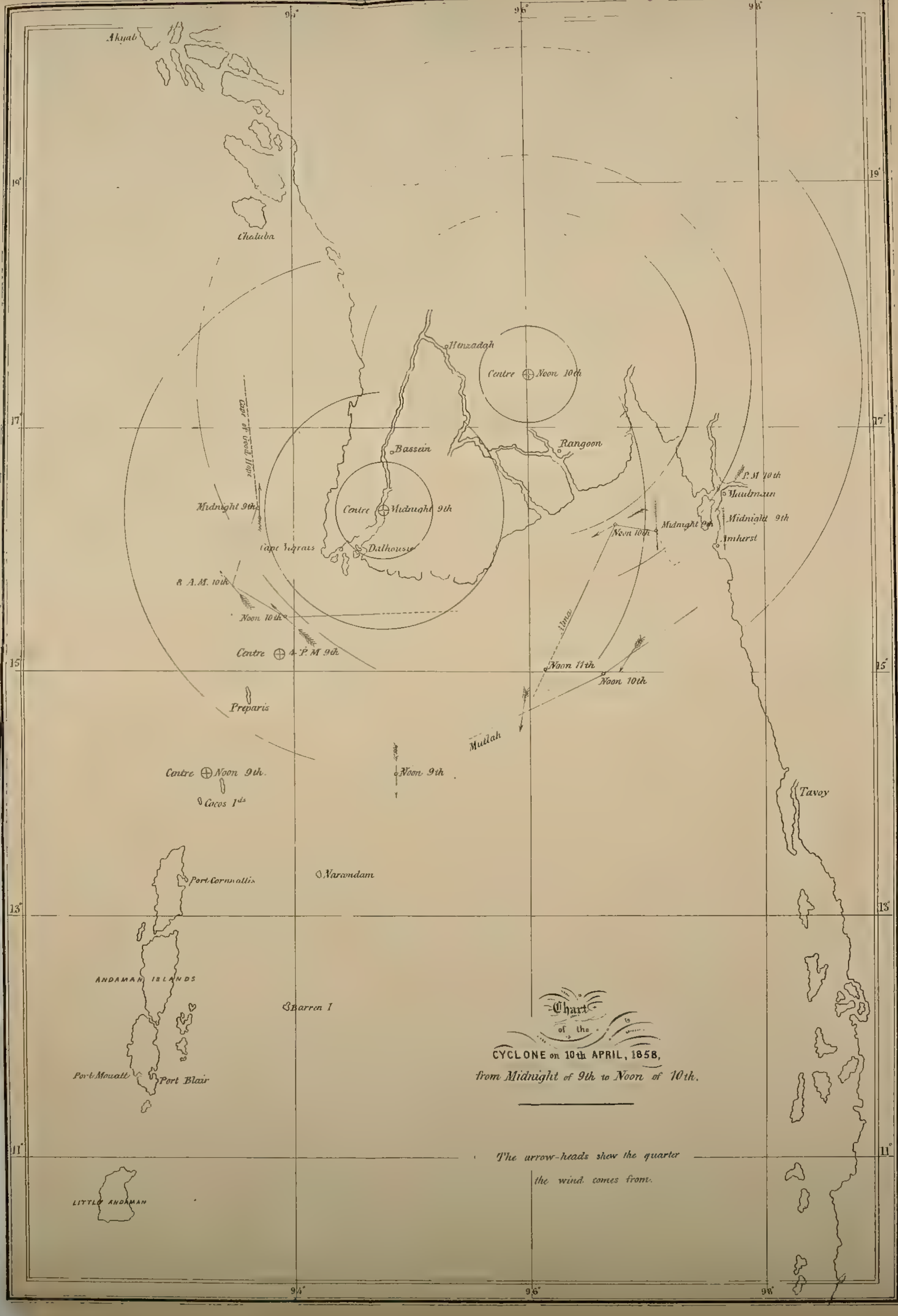
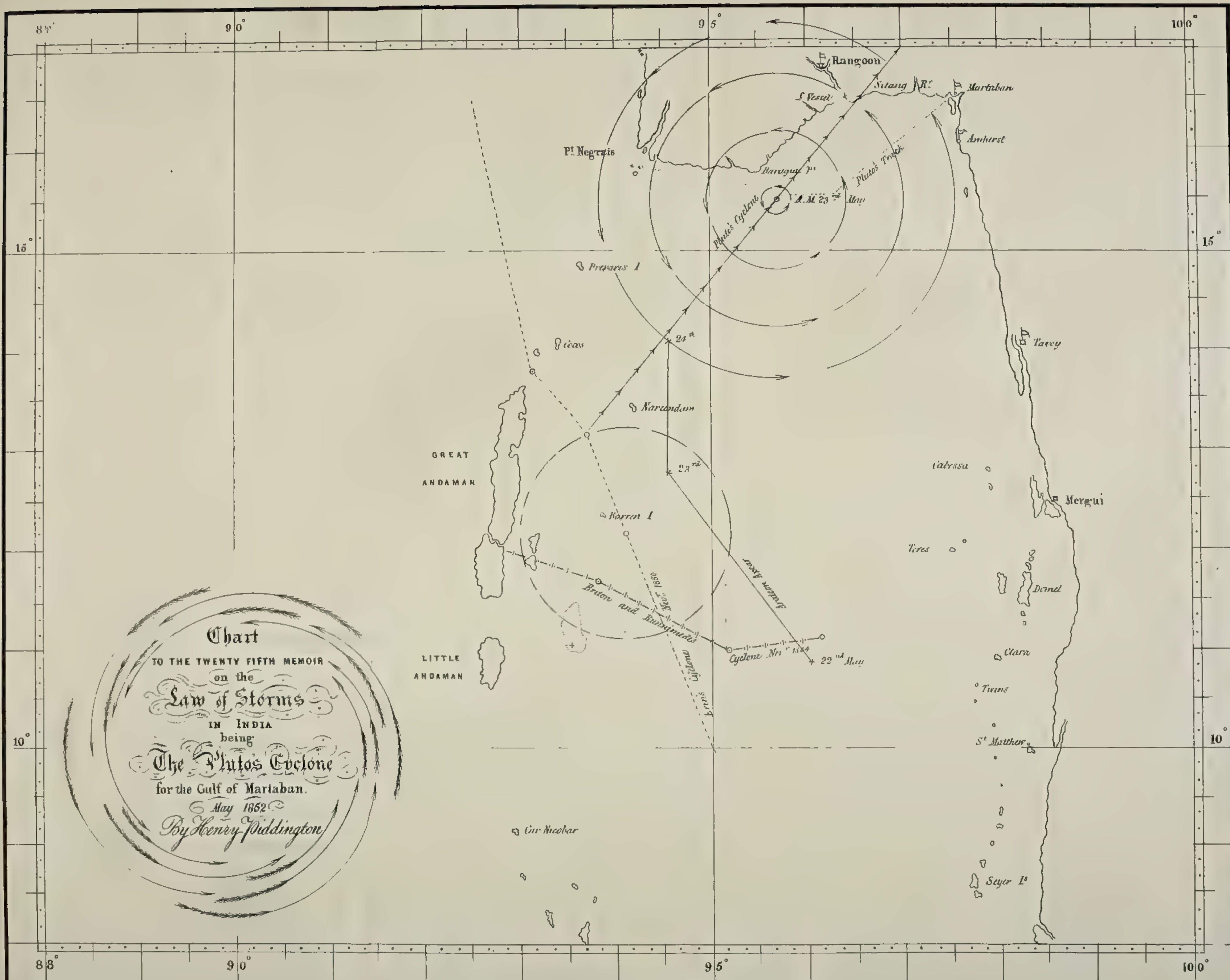


Chart
of the
CYCLONE on 9th of APRIL, 1858,
from Noon to Midnight
and
S. E. Current on 7th April.
The arrow-heads show the quarter
the wind comes from
Ramree.
Noon 9th
Cheduba
8 P.M. 9th
Henzadah
Calventuras
Bassein
Rangoon
Midnight 9th
Centre
Midnight 9th
Cape Negrais
Pt. Dalhousie
Maulmain
Midnight 9th
Midnight 9th
Amherst
P.M. 9th
9 P.M. 9th
Calegour
Alma
Coromandel
Centre
P.M.
A.M. 9th
Noon 9th
Preparis
Noon 8th
Centre
Noon 9th
Cocos Islands
Mutlah
Noon 9th
Semiramus
Tavoy
A.M. 9th
Midnight 7th
LITTLE ANDAMAN
19°
17°
15°
13°
11°



Akyab
Chaluba
Henzadah
Centre Noon 10th
Bassein
Rangoon
Cape of Good Hope
Midnight 9th
Centre Midnight 9th
Cape Negrais
Dalhousie
8 A.M. 10th
Noon 10th
Centre 4 P.M 9th
P.M 10th
Maulmain
Midnight 9th
Midnight 9th
Noon 10th
Amherst
Alma
Noon 11th
Noon 10th
Mutlah
Preparis
Centre Noon 9th.
Noon 9th
Cocos Ids
Tavoy
Narcondam
Port Cornwallis
ANDAMAN ISLANDS
Barren I
Port Mouatt
Port Blair
LITTLE ANDAMAN
19°
17°
15°
13°
11°
94°
96°
98°
Chart of the
CYCLONE on 10th APRIL, 1858,
from Midnight of 9th to Noon of 10th.
The arrow-heads shew the quarter the wind comes from.



Lith: By H.M. Smith Survr. Genl's. Office Calcutta Feby. 1858.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1857.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.422	29.464	29.373	0.091	79.7	81.8	77.8	4.0
2	.413	.466	.372	.094	81.8	85.9	78.6	7.3
3	.425	.462	.373	.089	81.6	85.2	79.2	6.0
4	.409	.449	.351	.098	82.4	86.0	79.5	6.5
5	*Sunday.*							
6	.381	.426	.328	.098	81.3	84.8	79.3	5.5
7	.466	.544	.396	.148	81.7	85.3	78.8	6.5
8	.543	.595	.501	.094	83.1	87.2	79.4	7.8
9	.563	.598	.499	.099	83.7	87.2	80.4	6.8
10	.528	.575	.478	.097	84.1	90.0	81.2	8.8
11	.516	.560	.444	.116	82.0	84.2	80.2	4.0
12	*Sunday.*							
13	.515	.559	.465	.094	84.7	90.0	81.2	8.8
14	.514	.551	.450	.101	83.9	89.4	80.0	9.4
15	.476	.530	.412	.118	84.3	88.9	81.0	7.9
16	.476	.521	.423	.098	82.9	84.8	81.4	3.4
17	.500	.556	.454	.102	82.5	85.9	79.6	6.3
18	.531	.598	.477	.121	82.2	85.6	80.0	5.6
19	*Sunday.*							
20	.584	.628	.541	.087	82.3	85.3	80.6	4.7
21	.575	.626	.512	.114	81.7	84.0	79.6	4.4
22	.594	.645	.543	.102	80.6	86.6	77.2	9.4
23	.642	.684	.597	.087	79.5	81.6	77.4	4.2
24	.678	.732	.636	.096	81.3	87.5	78.2	9.3
25	.663	.714	.582	.132	82.9	88.9	79.0	9.9
26	*Sunday.*							
27	.674	.742	.608	.134	81.7	86.5	78.6	7.9
28	.709	.756	.654	.102	82.1	88.4	78.7	9.7
29	.692	.748	.605	.143	81.8	85.9	78.8	7.1
30	.643	.691	.558	.133	82.0	87.5	78.8	8.7
31	.635	.674	.576	.098	81.5	85.5	79.0	6.5

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1857.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	78.1	1.6	77.3	2.4	0.919	9.94	0.78	0.93
2	79.5	2.3	78.3	3.5	.949	10.20	1.20	.90
3	79.6	2.0	78.6	3.0	.958	.32	.02	.91
4	80.3	2.1	79.2	3.2	.976	.50	.11	.90
5	*Sunday.*							
6	79.0	2.3	77.8	3.5	.934	.05	.19	.89
7	78.8	2.9	77.3	4.4	.919	9.90	.47	.87
8	80.0	3.1	78.4	4.7	.952	10.21	.65	.86
9	80.7	3.0	79.2	4.5	.976	.45	.62	.87
10	80.5	3.6	78.7	5.4	.961	.31	.90	.84
11	79.8	2.2	78.7	3.3	.961	.35	.12	.90
12	*Sunday.*							
13	81.7	3.0	80 2	4.5	1.008	.77	.65	.87
14	81.1	2.8	79.7	4.2	0.992	.63	.50	.88
15	80.9	3.4	79.2	5.1	.976	.45	.83	.85
16	80.6	2.3	79.4	3.5	.983	.54	.25	.89
17	80.1	2.4	78.9	3.6	.967	.39	.25	.89
18	80.1	2.1	79.0	3.2	.970	.44	.10	.91
19	*Sunday*							
20	80.2	2.1	79.1	3.2	.973	.47	.11	.90
21	79.3	2.4	78 1	3.6	.943	.14	.23	.89
22	77.3	3.3	75.6	5.0	.871	9.39	.62	.85
23	77.2	2.3	76.0	3.5	.882	.52	.14	.89
24	78.2	3.1	76.6	4.7	.899	.67	.57	.86
25	79.7	3.2	78.1	4 8	.943	10.12	.67	.86
26	*Sunday.*							
27	78.8	2.9	77.3	4.4	.919	9.90	.47	.87
28	78.8	3.3	77.1	5.0	.913	.82	.69	.85
29	78.7	3.1	77.1	4.7	.913	.82	.58	.86
30	78.9	3.1	77.3	4.7	.919	.88	.59	.86
31	78.8	2.7	77.4	4.1	.922	.93	.38	.88

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.561	29.744	29.372	0.372	80.6	83.2	77.4	5.8
1	.547	.729	.359	.370	80.4	82.7	77.5	5.2
2	.535	.713	.348	.365	80.3	82.9	77.7	5.2
3	.525	.708	.336	.372	80.1	82.2	78.1	4.1
4	.528	.704	.328	.376	80.0	82.0	78.4	3.6
5	.534	.703	.380	.323	79.9	81.6	78.4	3.2
6	.549	.715	.353	.362	79.8	81.8	77.8	4.0
7	.565	.729	.388	.341	80.3	82.2	77.8	4.4
8	.578	.751	.410	.341	81.4	84.2	77.8	6.4
9	.586	.756	.417	.339	82.5	85.4	78.4	7.0
10	.588	.754	.421	.333	83.6	86.8	79.0	7.8
11	.580	.736	.422	.314	84.4	88.4	79.2	9.2
Noon.	.567	.725	.408	.317	84.3	90.0	79.6	10.4
1	.550	.705	.384	.321	84.9	90.0	80.0	10.0
2	.527	.691	.370	.321	85.0	89.4	80.0	9.4
3	.510	.682	.349	.333	84.7	89.4	80.6	8.8
4	.498	.665	.335	.330	84.4	88.8	80.2	8.6
5	.496	.654	.341	.313	83.7	87.0	79.8	7.2
6	.506	.655	.356	.299	83.2	87.0	79.2	7.8
7	.527	.664	.373	.291	82.6	86.6	78.5	8.1
8	.546	.694	.401	.293	81.9	84.4	78.3	6.1
9	.566	.725	.419	.306	81.7	84.0	77.6	6.4
10	.582	.748	.426	.322	81.5	83.6	77.2	6.4
11	.581	.741	.422	.319	81.1	83.4	77.2	6.2

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	78.6	2.0	77.6	3.0	0.928	10.01	1.00	0.91
1	78.6	1.8	77.7	2.7	.931	.04	0.90	.92
2	78.5	1.8	77.6	2.7	.928	.01	.90	.92
3	78.4	1.7	77.5	2.6	.925	9.98	.86	.92
4	78.3	1.7	77.4	2.6	.922	.95	.86	.92
5	78.1	1.8	77.2	2.7	.916	.89	.89	.92
6	78.1	1.7	77.2	2.6	.916	.89	.86	.92
7	78.4	1.9	77.4	2.9	.922	.95	.96	.91
8	79.0	2.4	77.8	3.6	.934	10.05	1.22	.89
9	79.6	2.9	78.1	4.4	.943	.14	.50	.87
10	80.1	3.5	78.3	5.3	.949	.18	.85	.85
11	80.6	3.8	78.7	5.7	.961	.29	2.02	.84
Noon.	80.7	3.6	78.9	5.4	.967	.37	1.91	.84
1	80.9	4.0	78.9	6.0	.967	.34	2.15	.83
2	80.9	4.1	78.8	6.2	.964	.31	.22	.82
3	80.9	3.8	79.0	5.7	.970	.37	.05	.84
4	80.8	3.6	79.0	5.4	.970	.40	1.91	.85
5	80.4	3.3	78.7	5.0	.961	.31	.76	.85
6	80.2	3.0	78.7	4.5	.961	.31	.58	.87
7	79.8	2.8	78.4	4.2	.952	.23	.45	.88
8	79.4	2.5	78.1	3.8	.943	.14	.30	.89
9	79.4	2.3	78.2	3.5	.946	.17	.20	.89
10	79.2	2.3	78.0	3.5	.940	.11	.20	.89
11	79.0	2.1	77.9	3.2	.937	.10	.07	.90

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1857.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	..	..	S. W.	Cloudy: also drizzling occasionally.
2	..	0.37	S. W. & S.	Cloudy; also raining between 8 & 10 A. M.
3	..	1.22	S. W. & S.	Cloudy and constantly raining between 3 and 10 A. M. also between 8 and 11 P. M.
4	..	2.20	S. W. & S.	Cloudy, also occasionally heavy shower.
5	*Sunday.*	0.79		
6	..	0.23	S.	Cloudy, with occasional drizzling.
7	..	0.30	S.	Cloudy with little rain.
8	..	..	S.	Cloudy.
9	..	..	S.	Cloudy.
10	..	..	S. & S. W.	Cloudy. Also slightly drizzling between 5 and 9 P. M. [8 A. M. and 1 P. M.
11	..	..	S. W. & S.	Cloudy. Also slightly drizzling between
12	*Sunday.*	..		
13	..	0.28	S. & S. W.	Cloudy. Also rain at 3 P. M.
14	..	0.92	S. & S. W. & N. W.	Cloudy and raining occasionally.
15	..	..	S. W.	Cloudless till 7 A. M. cloudy afterwards.
16	..	0.15	S. W. & calm & S.	Cloudy and raining between 1 & 2 P. M.
17	..	0.79	S. W. & S.	Cloudless till 2 A. M. cloudy till 3 P. M. Scatd. ╲i & ╲–i till 8 P. M. cloudless afterwards. Also raining between 6 & 9 A. M. [P. M.
18	..	0.70	S.	Cloudy, & constantly raining before 3
19	*Sunday.*	..		
20	..	0.66	S. & S. W.	Cloudless till 5 A. M. cloudy afterwards: also constantly raining after 8 A. M.
21	..	0.40	S.	Cloudy. Also incessantly raining between Midnight & 2 P. M. [4 & 10 P. M.
22	..	1.11	S.	Cloudy. Also incessantly raining between
23	..	0.08	S. & S. W.	Cloudy. Also occasionally raining.
24	..	0.26	S. & N. E.	Cloudy. Also raining at 5 P. M. [5 P. M.
25	..	..	S. & S. W.	Cloudy. Also very slightly drizzling at
26	*Sunday.*	1.53		
27	..	0.56	E. & S. E. & S.	Cloudy. Also raining between 2 & 3 P. M.
28	..	0.16	E. & S. E.	Cloudy. Also raining between 4 & 5 P. M.
29	..	..	E. & S. E.	Cloudless till 4 A. M. Scatd. clouds till 7 P. M. cloudless afterwards.
30	..	0.27	S. E. & E.	Cloudless till 4 A. M. Scatd. clouds afterwards: also slightly raining from Noon to 4 P. M.
31	..	..	E. & S. E.	Cloudless till 5 P. M. cloudy afterwards: also very slightly drizzling at 2 P. M.

╲i Cirri, ╲–i Cirro strati, ⌒i Cumuli, ⌒–i Cumulo strati, ╲⌒–i Nimbi, —i Strati ╲⌒ i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1857.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.547
Max. height of the Barometer occurred at 9 A. M. on the 28th, ..	29.756
Min. height of the Barometer occurred at 4 A. M. on the 6th, ..	29.328
Extreme range of the Barometer during the month, ...	0.428

	o
Mean Dry Bulb Thermometer for the month, ...	82.2
Max. Temperature occurred at Noon & 1 P. M. on the 10th & 13th,..	90.0
Min. Temperature occurred at 10 & 11 P. M. on the 22nd, ..	77.2
Extreme range of the Temperature during the month, ...	12.8

	o
Mean Wet Bulb Thermometer for the month, ...	79.5
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,..	2.7
Computed Mean Dew-point for the month, ...	78.1
Mean Dry Bulb Thermometer above computed mean Dew-point, ..	4.1
	Inches.
Mean Elastic force of Vapour for the month, ...	0.943

	Troy grains.
Mean Weight of Vapour for the month, ...	10.14
Additional Weight of Vapour required for complete saturation, ..	1.40
Mean degree of humidity for the month, complete saturation being unity,	0.88

	Inches.
Rained 27 days, Max. fall of rain during 24 hours, ...	2.20
Total amount of rain during the month, ...	12.98
Prevailing direction of the Wind, ...	S.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1857.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.
					No. of days.													
Midnight.					1		3		16	2	5						2	
1					1		3		14	2	5						4	
2					2		2		16	3	4						3	
3					3		1		15	3	4	1					3	
4			1		3				15	3	4	1					3	
5			2		3				12	1	6	2	1	1			1	
6			3		3				12	3	6	2			2	1	1	
7			2		5	1			12	1	7	1			1			
8					6	1			9	1	11	4			1			
9	1				3		2		9	1	9	4	2		1			
10					3		2		11	2	9	2	1		1			
11			1		2		2		8	3	13	2	1	1				
Noon.			2		1		3	1	6	3	14	4	1					
1			1		2		2	2	9	4	11	3	2					
2			1	1	3		4	2	9	4	8	2	2					
3			1		3		3		11	2	7	1	1		1			
4					2		1	1	9	1	13	2			2			
5					1		2		13	3	9	2			2	1		
6			1		2	1	2		15	3	6		1					
7			1		1		3		16	3	5		1					
8			1		1		3		15	2	5	1	1				1	
9			1		2		2		17	3	5	1						
10			1		3		2		16	2	5							
11			1		2		3		16	1	5							

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1857.

On the 21st July, 1857, the Meteorological Observations after ten minutes intervals being taken at the Surveyor General's Office, they indicate the following circumstances.

Exact Time of	Minimum Barometer, ..	A. M.	h. m. 3 20 & h. m. 4 0
		P. M.	4 50
Ditto	Maximum Barometer, ..	A. M.	10 40
		P. M.	10 30
Ditto	Minimum Temperature,	A. M.	Between h. m. 7 0 & h. m. 8 0 during the whole of which interval the thermometer stood at the same reading 79.6° which was the lowest temperature during the day.
Ditto	Maximum Temperature,	P. M.	h. m. 4 10

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1857.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.632	29.665	29.574	0.091	80.3	84.0	78.4	5.6
2	*Sunday.*							
3	.650	.701	.579	.122	81.0	85.0	77.6	7.4
4	.578	.671	.493	.178	81.0	83.6	79.4	4.2
5	.508	.557	.446	.111	80.3	81.8	79.0	2.8
6	.462	.506	.422	.084	79.5	81.4	76.6	4.8
7	.454	.492	.392	.100	81.0	84.0	78.7	5.3
8	.447	.487	.389	.098	81.8	85.0	79.1	5.9
9	*Sunday.*							
10	.469	.536	.424	.112	80.9	83.4	78.8	4.6
11	.505	.553	.457	.096	81.5	87.0	79.4	7.6
12	.514	.558	.447	.111	81.0	84.2	79.4	4.8
13	.483	.535	.407	.128	81.1	86.0	77.7	8.3
14	.462	.512	.386	.126	81.8	86.8	78.8	8.0
15	.473	.516	.403	.113	82.4	87.4	78.8	8.6
16	*Sunday.*							
17	.438	.506	.359	.147	82.2	88.8	79.8	9.0
18	.406	.456	.335	.121	82.8	87.7	80.2	7.5
19	.352	.463	.239	.224	81.9	85.4	79.6	5.8
20	.493	.568	.418	.150	82.7	87.7	78.6	9.1
21	.531	.576	.463	.113	84.1	89.0	80.9	8.1
22	.534	.576	.482	.094	83.5	85.3	81.8	3.5
23	*Sunday.*							
24	.584	.629	.533	.096	81.4	86.2	77.4	8.8
25	.587	.638	.511	.127	83.7	89.4	80.6	8.8
26	.561	.604	.492	.112	84.2	89.0	80.6	8.4
27	.571	.635	.513	.122	83.6	89.4	80.6	8.8
28	.596	.650	.530	.120	82.8	86.4	80.2	6.2
29	.577	.619	.518	.101	82.7	87.4	80.3	7.1
30	*Sunday.*							
31	.561	.732	.587	.145	82.3	86.0	79.6	6.4

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived, from the twenty-four hourly observations made, during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1857.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	78.2	2.1	77.1	3.2	0.913	9.86	1.05	0.90
2	*Sunday.*							
3	78.6	2.4	77.4	3.6	.922	.93	.21	.89
4	79.2	1.8	78.3	2.7	.949	10.22	0.92	.92
5	78.5	1.8	77.6	2.7	.928	.01	.90	.92
6	77.5	2.0	76.5	3.0	.896	9.69	.97	.91
7	78.4	2.6	77.1	3.9	.913	.84	1.30	.88
8	79.2	2.6	77.9	3.9	.937	10.08	.32	.88
9	*Sunday.*							
10	78.9	2.0	77.9	3.0	.937	.10	.00	.91
11	79.1	2.4	77.9	3.6	.937	.08	.23	.89
12	79.0	2.0	78.0	3.0	.940	.13	.01	.91
13	78.5	2.6	77.2	3.9	.916	9.87	.30	.88
14	78.4	3.4	76.7	5.1	.902	.70	.70	.85
15	79.0	3.4	77.3	5.1	.919	.88	.73	.85
16	*Sunday.*							
17	79.6	2.6	78.3	3.9	.949	10.20	.34	.88
18	80.0	2 8	78.6	4.2	.958	.30	.45	.88
19	79.0	2.9	77.5	4.4	.925	9.96	.48	.87
20	79.8	2.9	78.3	4.4	.949	10.20	.52	.87
21	80.5	3.6	78.7	5.4	.961	.31	.90	.84
22	80.6	2.9	79.1	4.4	.973	.45	.55	.87
23	*Sunday.*							
24	78.3	3.1	76.7	4.7	.902	9.70	.57	.86
25	79.8	3.9	77.8	5.9	.934	10.01	2.06	.83
26	80.1	4.1	78.0	6.2	.940	.07	.17	.82
27	80.0	3.6	78.2	5.4	.946	.15	1.88	.84
28	79.3	3.5	77.5	5.3	.925	9.94	.81	.85
29	79.6	3.1	78.0	4.7	.940	10.09	.63	.86
30	*Sunday.*							
31	79.8	2.5	78.5	3.8	.955	.27	.31	.89

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta in the month of August, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.545	29.671	29.398	0.273	80.5	82.9	77.6	5.3
1	.531	.664	.391	.273	80.3	82.7	77.4	5.3
2	.514	.660	.354	.306	80.1	82.6	77.6	5.0
3	.508	.650	.351	.299	80.0	82.4	77.5	4.9
4	.502	.629	.342	.287	79.7	82.2	77.6	4.6
5	.507	.633	.342	.291	79.6	82.2	77.6	4.6
6	.524	.668	.352	.316	79.6	81.8	77.8	4.0
7	.539	.695	.357	.338	80.0	82.6	76.6	6.0
8	.552	.696	.369	.327	81.0	83.8	77.8	6.0
9	.558	.698	.376	.322	82.5	85.4	78.8	6.6
10	.560	.705	.375	.330	83.6	85.8	79.4	6.4
11	.550	.691	.364	.327	84.2	87.5	79.8	7.7
Noon.	.534	.683	.333	.350	84.6	87.8	79.9	7.9
1	.514	.660	.301	.359	84.8	88.8	79.4	9.4
2	.491	.638	.261	.377	84.6	89.4	80.8	8.6
3	.472	.622	.239	.383	84.6	89.2	80.6	8.6
4	.461	.619	.251	.368	84.5	89.4	80.6	8.8
5	.462	.634	.271	.363	83.5	87.4	79.9	7.5
6	.474	.649	.314	.335	82.6	86.8	79.4	7.4
7	.494	.673	.346	.327	81.9	84.0	79.5	4.5
8	.521	.698	.388	.310	81.6	83.8	79.6	4.2
9	.544	.717	.403	.314	81.3	83.8	79.7	4.1
10	.560	.732	.429	.303	81.0	83.2	79.4	3.8
11	.556	.732	.428	.304	80.9	83.2	79.4	3.8

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulu Thermometers are derived from the observations made at the several honrs during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Midnight.	78.7	1.8	77.8	2.7	0.934	10.07	0.91	0.92
1	78.6	1.7	77.7	2.6	.931	.04	.87	.92
2	78.4	1.7	77.5	2.6	.925	9.98	.86	.92
3	78.4	1.6	77.6	2.4	.928	10.03	.78	.93
4	78.1	1.6	77.3	2.4	.919	9.94	.78	.93
5	78.0	1.6	77.2	2.4	.916	.91	.78	.93
6	77.9	1.7	77.0	2.6	.910	.83	.86	.92
7	78.2	1.8	77.3	2.7	.919	.92	.89	.92
8	78.7	2.3	77.5	3.5	.925	.96	1.18	.89
9	79.5	3.0	78.0	4.5	.940	10.09	.55	.87
10	79.7	3.9	77.7	5.9	.931	9.98	2.05	.83
11	80.1	4.1	78.0	6.2	.940	10.07	.17	.82
Noon.	80.3	4.3	78.1	6.5	.943	.08	.31	.81
1	80.3	4.5	78.0	6.8	.940	.05	.41	.81
2	80.4	4.2	78.3	6.3	.949	.16	.23	.82
3	80.2	4.4	78.0	6.6	.940	.05	.34	.81
4	80.2	4.3	78.0	6.5	.940	.05	.30	.81
5	79.9	3.6	78.1	5.4	.943	.12	1.88	.84
6	79.5	3.1	77.9	4.7	.937	.06	.62	.86
7	79.2	2.7	77.8	4.1	.934	.05	.39	.88
8	79.2	2.4	78.0	3.6	.940	.11	.23	.89
9	79.1	2.2	78.0	3.3	.940	.13	.11	.90
10	79.0	2.0	78.0	3.0	.940	.13	.01	.91
11	79.0	1.9	78.0	2.9	.940	.13	0.97	.91

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1857.

Solar radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	..	2.11	E.	Cloudy also raining between 10 A. M. [& 1 P. M.
2	*Sunday.*			
3	..	0.60	S. & S. E. & E.	Cloudy, also raining between 4 & 8 A. M.
4	..	2.10	S. W. & S. & S. E.	Cloudy, also raining between 8 A. M. & 3 P. M.
5	..	0.20	S. & S. W.	Cloudy, also raining between 1 and 6 [P. M.
6	..	2.08	S.	Cloudy with incessant rain.
7	..	..	S.	Cloudy and occasionally drizzling.
8	..	0.20	S.	Cloudy and drizzling occasionally.
9	*Sunday.*	0.18		
10	..	0.34	S. E. & S.	Cloudy and drizzling occasionally.
11	..	0.28	E. & S. E.	Cloudy and raining between 2 & 3 P. M.
12	..	0.52	S. E. & S. W. & E.	Cloudy with occasional rain.
13	..	0.50	S. E. & S.	Cloudy & also raining between 1 and 2 [P. M.
14	..	..	E. & N. E. & S. E.	Cloudy with slight drizzling now and then.
15	..	0.37	E.	Cloudy and slightly raining after 12.
16	*Sunday.*			
17	..	0.45	N. E. & E. & S.	Cloudy and slightly drizzling between [2 and 5 P. M.
18	..	0.36	N. E.	Cloudless till 2 A. M. cloudy afterwards; with occasional drizzling.
19	..	0.17	N. & S. E. & N. E.	Cloudy with occasional drizzling.
20	..	1.63	S. E. & N. E.	Cloudy also raining constantly.
21	..	..	S.	Cloudy.
22	..	..	S. W. & S.	Scatd. \–i till 9 A. M. cloudy afterwards, also very slightly drizzling between 4 & 5 P. M.
23	*Sunday.*	3.74		
24	..	0.58	S. W. & S.	Cloudy also constantly raining before sun rise.
25	124.0	..	S.	Cloudy also very slightly drizzling at [6 P. M.
26	124.0	0.17	S.	Scatd. clouds also raining between 9 & 10 P. M.
27	131.0	0.64	S. & S. W.	Cloudy also incessantly raining between [5 P. M. and midnight.
28	..	..	S. W.	Cloudy also occasionally drizzling before sun rise.
29	..	1.25	S. W. & S. & S. E.	Cloudy also raining between 4 & 7 P. M.
30	*Sunday.*			
31	..	0.23	S. E. & E.	Cloudy also raining between 3 & 4 P. M.

\i Cirri, \–i cirro strati, ⌒i cumuli, ⌒–i cumulo strati, \⌒–i nimbi, —i strati, \⌒i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1857.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.520
Max. height of the Barometer, occurred at 10 & 11 P. M. on the 31st, ..	29.732
Min. height of the Barometer, occurred at 3 P. M. on the 19th, ..	29.239
Extreme Range of the Barometer during the month, ...	0.493

	o
Mean Dry Bulb Thermometer for the month, ...	82.0
Max. Temperature, occurred at 2 P. M. on the 25th, and 4 P. M. on the 27th,	89.4
Min. Temperature, occurred at 7 A. M. on the 6th, ...	76.6
Extreme Range of the Temperature during the month, ...	12.8

	o
Mean Wet Bulb Thermometer for the month, ...	79.2
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	2.8
Computed Mean Dew Point for the month, ...	77.8
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	4.2
	Inches.
Mean Elastic force of vapour for the month, ...	0.934

	Troy grains.
Mean weight of vapour for the month, ...	10.05
Additional weight of vapour required for complete saturation, ..	1.42
Mean degree of Humidity for the month, complete saturation being unity,	0.88

	Inches.
Rained 28 days. Max. fall of rain during 24 hours, ...	3.74
Total amount of rain during the month, ...	18.70
Prevailing direction of the Wind, ...	S.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1857.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	1				6	1	5		12	2					1	1	1		
1	1				5		6	2	11	1	1				1	1	1		
2	1				5		6	2	10	3	1	1			1	1	1		1
3	1		1		4		6	3	10	2	1	1			1	1	2		
4	1		1	1	3	1	5	1	10	3	2				1		1		2
5	1		2		3		5	1	8	2	4	1			1				2
6	1	1	5	1	5	1	3		8	1	4								
7			5	1	7	1	2		8	3	3		1						
8	1		3	1	5	1	3	2	7	3	6		1						
9			4		4		4		8		4				1				1
10	1		3	1	5	1	6	1	4		7								
11			3	1	7	2	3	1	3		8		2						
Noon.			4	2	6	3	4	2	4	1	6				2				
1			4		4	2	4	3	8	1	5	1			1				
2			4	1	3	1	5	1	6	3	8	3							
3			2	1	5	2	2		11	2	5	2	1						
4			2	1	2	1	4		10	2	7	1	1	1					
5			2	1	2	1	6	3	8	1	7	1	1						
6			2		2		6	1	11	2	5	1							
7			2		3	1	4	2	12	4	5								
8			1		3		6		11	2	5								
9			1		4		6		10	2	4						1		
10			1		4	1	6		11	4	2						1		1
11			1		4		6		12	1	2						1		

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1857.

On the 20th August, 1857, the Meteorological Observations after ten minutes intervals being taken at the Surveyor General's Office, they indicate the following circumstances :—

Exact Time of Minimum Barometer,...	A. M. Between 3-10 & 3-20 (h. m.) during which time the Barometer was stationary. P. M. 4-30 (h. m.).
Ditto Maximum Barometer,.........	A. M. 10-10 (h. m.). P. M. Between 10-30. & 10-50 (h. m.) during which time the Barometer was stationary.
Ditto Minimum Temperature,......	A. M. 3-30 also 7-30 (h. m.).
Ditto Maximum Temperature,......	P. M. Between 2-30 and 2-40 (h. m.) during which time the Thermometer was stationary.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1857.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.729	29.794	29.673	0.121	83.1	87.8	79.5	8.3
2	.680	.748	.596	.152	84.0	89.5	81.5	8.0
3	.608	.677	.553	.124	83.2	88.2	76.6	11.6
4	.629	.686	.548	.138	82.6	88.3	79.0	9.3
5	.624	.697	.543	.154	82.1	87.8	78.6	9.2
6	*Sunday.*							
7	.536	.585	.456	.129	81.6	86.0	79.2	6.8
8	.473	.553	.374	.179	77.8	79.6	76.8	2.8
9	.566	.662	.488	.174	79.1	83.0	75.6	7.4
10	.666	.720	.621	.099	80.3	83.6	78.5	5.1
11	.738	.805	.679	.126	82.7	88.4	78.4	10.0
12	.764	.840	.690	.150	84.2	89.2	80.0	9.2
13	*Sunday.*							
14	.690	.753	.618	.135	85.1	91.0	82.4	8.6
15	.746	.814	.685	.129	84.0	90.2	80.4	9.8
16	.749	.813	.669	.144	85.5	91.3	81.4	9.9
17	.718	.790	.637	.153	84.7	89.4	81.6	7.8
18	.731	.773	.669	.104	81.2	86.8	76.4	10.4
19	.772	.820	.732	.088	80.5	84.6	78.6	6.0
20	*Sunday.*							
21	.800	.848	.755	.093	79.4	82.3	78.2	4.1
22	.774	.833	.721	.112	81.2	85.2	79.1	6.1
23	.776	.837	.722	.115	81.4	87.2	78.6	8.6
24	.748	.798	.685	.113	81.7	85.8	78.0	7.8
25	.763	.823	.697	.126	83.5	89.2	79.6	9.6
26	.756	.818	.696	.122	82.0	85.4	79.6	5.8
27	*Sunday.*							
28	.749	.800	.689	.111	85.3	91.6	80.1	11.5
29	.781	.834	.722	.112	84.0	90.6	78.6	12.0
30	.764	.837	.683	.154	83.6	91.6	77.4	14.2

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1857.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	79.8	3.3	78.1	5.0	0.943	10.12	1.74	0.85
2	80.7	3.3	79.0	5.0	.970	.40	.77	.86
3	79.8	3.4	78.1	5.1	.943	.12	.77	.85
4	79.4	3.2	77.8	4.8	.934	.03	.65	.86
5	79.5	2.6	78.2	3.9	.946	.17	.34	.88
6	*Sunday.*							
7	78.3	3.3	76.6	5.0	.899	9.67	.67	.85
8	76.0	1.8	75.1	2.7	.857	.28	0.85	.92
9	77.3	1.8	76.4	2.7	.893	.66	.87	.92
10	78.5	1.8	77.6	2.7	.928	10.01	.90	.92
11	79.7	3.0	78.2	4.5	.946	.15	1.57	.87
12	80.2	4.0	78.2	6.0	.946	.13	2.11	.83
13	*Sunday.*							
14	81.0	4.1	78.9	6.2	.967	.34	.23	.82
15	80.5	3.5	78.7	5.3	.961	.31	1.86	.85
16	81.1	4.4	78.9	6.6	.967	.32	2.40	.81
17	80.5	4.2	78.4	6.3	.952	.19	.23	.82
18	77.6	3.6	75.8	5.4	.876	9.44	1.77	.84
19	78.1	2.4	76.9	3.6	.908	.78	.20	.89
20	*Sunday*							
21	77.4	2.0	76.4	3.0	.893	.66	0.94	.91
22	78.8	2.4	77.6	3.6	.928	.99	1.22	.89
23	78.7	2.7	77.3	4.1	.919	.90	.37	.88
24	79.0	2.7	77.6	4.1	.928	.99	.38	.88
25	79.5	4.0	77.5	6.0	.925	.92	2.08	.83
26	79.3	2.7	77.9	4.1	.937	10.08	1.39	.88
27	*Sunday.*							
28	79.9	5.4	77.2	8.1	.916	9.79	2.85	.78
29	77.2	6.8	73.8	10.2	.822	8.80	3.37	.72
30	77.0	6.6	73.7	9.9	.819	.78	.25	.73

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.719	29.819	29.524	0.295	80.7	84.2	77.2	7.0
1	.707	.803	.511	.292	80.4	83.6	76.8	6.8
2	.697	.798	.507	.291	80.2	83.2	76.8	6.4
3	.687	.785	.491	.294	79.7	83.0	76.6	6.4
4	.685	.775	.484	.291	79.7	82.6	76.0	6.6
5	.696	.787	.478	.309	79.5	82.4	76.0	6.4
6	.710	.802	.481	.321	79.5	82.6	75.6	7.0
7	.729	.822	.500	.322	80.1	82.8	75.6	7.2
8	.750	.839	.509	.330	81.9	84.8	77.3	7.5
9	.759	.845	.490	.355	83.1	86.4	77.8	8.6
10	.759	.846	.489	.357	83.8	87.8	76.8	11.0
11	.745	.848	.456	.392	85.0	89.0	77.2	11.8
Noon.	.726	.833	.445	.388	85.6	90.1	77.9	12.2
1	.698	.798	.408	.390	86.2	91.2	78.0	13.2
2	.671	.797	.374	.423	86.5	91.6	77.7	13.9
3	.651	.788	.377	.411	86.0	91.6	77.2	14.4
4	.644	.763	.388	.375	85.5	90.8	77.8	13.0
5	.649	.755	.409	.346	84.2	89.4	77.2	12.2
6	.663	.755	.447	.308	83.1	87.8	77.1	10.7
7	.684	.771	.459	.312	82.2	86.6	76.6	10.0
8	.711	.789	.483	.306	81.7	85.2	76.6	8.6
9	.727	.803	.524	.279	81.5	84.5	78.1	6.4
10	.734	.813	.528	.285	81.3	83.8	78.4	5.4
11	.731	.806	.537	.269	81.0	83.6	78.4	5.2

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observation made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	78.6	2.1	77.5	3.2	0.925	9.98	1.06	0.90
1	78.4	2.0	77.4	3.0	.922	.95	0.99	.91
2	78.3	1.9	77.3	2.9	.919	.92	.96	.91
3	78.0	1.7	77.1	2.6	.913	.86	.86	.92
4	77.9	1.8	77.0	2.7	.910	.83	.89	.92
5	77.7	1.8	76.8	2.7	.905	.77	.89	.92
6	77.8	1.7	76.9	2.6	.908	.80	.86	.92
7	78.3	1.8	77.4	2.7	.922	.95	.89	.92
8	79.1	2.8	77.7	4.2	.931	10.02	1.42	.88
9	79.3	3.8	77.4	5.7	.922	9.89	.97	.83
10	79.4	4.4	77.2	6.6	.916	.81	2.29	.81
11	79.9	5.1	77.3	7.7	.919	.82	.71	.78
Noon.	80.3	5.3	77.6	8.0	.928	.91	.85	.78
1	80.3	5.9	77.3	8.9	.919	.80	3.19	.75
2	80.5	6.0	77.5	9.0	.925	.86	.24	.75
3	80.3	5.7	77.4	8.6	.922	.83	.08	.76
4	79.9	5.6	77.1	8.4	.913	.76	2.96	.77
5	79.3	4.9	76.8	7.4	.905	.69	.55	.79
6	79.4	3.7	77.5	5.6	.925	.92	1.94	.84
7	79.0	3.2	77.4	4.8	.922	.91	.63	.86
8	78.8	2.9	77.3	4.4	.919	.90	.47	.87
9	78.8	2.7	77.4	4.1	.922	.93	.38	.88
10	78.6	2.7	77.2	4.1	.916	.87	.37	.88
11	78.7	2.3	77.5	3.5	.925	.96	.18	.89

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1857.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	..	0.08	E. & S.	Scrtd. \—i & ⌒i also raining at 1 P. M.
2	..	..	S. E. & S. W.	Cloudy; also slightly drizzling between 11 A. M. & Noon.
3	114.0	1.34	S. W. & E. & S.	Cloudy, also heavily raining between 6 & 7 P. M.
4	122.0	..	S. W. & E.	Scatd. \i & \—i till 7 A. M. scatd. clouds afterwards.
5	..	0.18	Variable.	Scatd. clouds; also raining slightly between 9 & 11 A. M.
6	*Sunday.*	0.08		
7	..	0.16	E. & N. E.	Cloudy and constantly raining.
8	..	4.10	E. (high.)	Cloudy and raining incessantly.
9	..	2.21	S. E. & E. & N. E. (high)	Cloudy and raining incessantly before sun rise and occasionally after it.
10	..	1.14	E. & S.	More or less cloudy till 7 P. M. cloudless afterwards; also heavy rain at 7 A. M. and 6 P. M.
11	113.4	..	E. & S. W.	Cloudy till 8 P. M. cloudless afterwards.
12	135.0	..	S. E. & S. W.	Cloudless till 3 A. M. cloudy afterwards.
13	*Sunday.*			
14	138.0	0.56	S. W. & S.	Cloudy, also raining heavily between 4 and 5 P. M.
15	..	..	S. & N. E. & N. W.	Cloudy till 8 P. M. cloudless afterwards, also slightly raining at 3 P. M.
16	133.0	..	N. E. & calm.	Cloudless till 7 A. M. Scatd. ⌒i afterwards.
17	119.9	..	N. E. & E. & calm.	Cloudy.
18	120.0	1.28	E. & N. E.	Scatd. clouds. Also raining between 2 & 8 P. M.
19	..	0.08	S. E. & E.	More or less cloudy the whole day, also slightly raining between 11 A. M. and 2 P. M.
20	*Sunday.*	0.65		
21	..	0.79	S. E.	Cloudy also raining occasionally.
22	..	0.26	S. & S. E.	Cloudy and slightly drizzling four times.
23	..	0.22	S. & S. E.	Cloudy also raining between 3 & 4 P. M.
24	..	..	S. & S. E.	Cloudy.
25	140.0	..	W. & S.	Cloudless till 5 A. M. Scatd. clouds afterwards. Also very slight drizzling between 5 and 6 P. M.
26	..	0.17	N. & W.	Cloudy also drizzling about Noon.
27	*Sunday.*			
28	132.8	..	calm & N. & N. W.	Cloudless till 8 A. M. scatd. ⌒i till 3 P. M. cloudless afterwards.
29	137.0	..	N. & N. W.	Cloudless.
30	138.0	..	N. & N. E.	Cloudless.

\i Cirri, \—i Cirro strati, ⌒i Cumuli, ⌒—i Cumulo strati, \⌒—i Nimbi, —i Strati, \⌒i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1857.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.705
Max. height of the Barometer occurred at 11 A. M. on the 21st, ..	29.848
Min. height of the Barometer occurred at 2 P. M. on the 8th, ..	29.374
Extreme range of the Barometer during the month, ...	0.474

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	o
Mean Dry Bulb Thermometer for the month, ...	82.5
Max. Temperature occurred at 3 P. M. on the 28th & also 2 P. M. on the 30th,	91.6
Min. Temperature occurred at 6 A. M. and also at 7 A. M. on the 9th, ..	75.6
Extreme range of the Temperature during the month, ...	16.0

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	o
Mean Wet Bulb Thermometer for the month, ...	79.0
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	3.5
Computed Mean Dew-point for the month, ...	77.2
Mean Dry Bulb Thermometer above computed mean Dew-point, ..	5.3
	Inches.
Mean Elastic force of Vapour for the month, ...	0.916

	Troy grains.
Mean Weight of Vapour for the month, ...	9.85
Additional Weight of Vapour required for complete saturation, ..	1.79
Mean degree of humidity for the month, complete saturation being unity,	0.85

	Inches.
Rained 20 days, Max. fall of rain during 24 hours, ...	4.10
Total amount of rain during the month, ...	13.30
Prevailing direction of the Wind, ...	E. & S. E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1857.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Missed.
					No. of days.													
Midnight.	1		3	1	5		5	1	3		3		1		1		3	1
1	2		1	1	6		5		3		3		2		1		3	
2	2		1	1	6	1	6	1	4		1		2		1		3	
3	2		2	2	5	1	6	1	3		1		1		1		2	3
4	2		1	1	7	2	6	1	2		1		2	1	1		3	1
5	1		1	1	7	2	6		3		2		2		1		3	
6	2		2	1	4		7		3		2		2		1		3	
7	2		1		7	3	5		4		1		2		1		3	
8	4		3		7	2	5		1		3		3					
9	3		4	1	6		4	1	1		3		4		1			
10	5		3	1	5		6	1	1				4		2			
11	4	1	3		5	1	7	1	2		3				2			
Noon.	5	1	5	1	2	1	5	2	4	1	2		1		2			
1	5	1	4		4	1	3	1	4	2	3		1		2			
2	4		3	1	4	1	5	2	2		5		1		2			
3	2		4	1	5	2	4	1	3		4	1			4	1		
4	1		3		4	1	6	1	6	1	2		1		3			
5	2	1	3		6	1	7	2	5	1	1	1	1		1			
6	2		3		6	4	4		6	2	3		1	1	1			
7	2		4		5	2	4		7		2		1		1			
8	1		3		6	1	3		7		3		1		1		1	
9	1		2		5		2		7	1	4		1		1		1	2
10			3		7	1	2		6		4		1		1		1	1
11	1		3		7	1	3	1	6		3		1				1	1

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1857.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.753	29.801	29.681	0.120	83.5	90.7	76.4	14.3
2	.760	.817	.694	.123	84.9	91.2	79.0	12.2
3	.784	.838	.725	.113	84.5	90.7	79.9	10.8
4	*Sunday.*							
5	.839	.895	.778	.117	84.8	91.8	81.2	10.6
6	.832	.897	.776	.121	82.1	87.9	79.0	8.9
7	.819	.869	.771	.098	81.7	88.0	78.2	9.8
8	.861	.916	.813	.103	82.8	88.2	77.7	10.5
9	.912	.997	.853	.144	81.2	87.8	77.8	10.0
10	.891	.967	.822	.145	83.0	88.7	78.2	10.5
11	*Sunday.*							
12	.882	.955	.814	.141	83.0	88.1	78.4	9.7
13	.922	30.000	.856	.144	82.9	89.2	78.1	11.1
14	.959	.040	.914	.126	82.2	87.9	76.9	11.0
15	.935	.020	.847	.173	81.9	88.7	75.8	12.9
16	.870	29.946	.793	.153	82.9	89.0	76.8	12.2
17	.856	.938	.800	.138	82.9	88.3	79.6	8.7
18	*Sunday.*							
19	.890	.969	.833	.136	84.1	89.8	80.0	9.8
20	.906	.982	.854	.128	81.7	88.0	76.2	11.8
21	.933	30.003	.877	.126	80.1	87.4	73.2	14.2
22	.942	.014	.886	.128	80.4	87.7	73.8	13.9
23	.914	29.973	.842	.131	80.9	87.2	75.0	12.2
24	.885	.956	.831	.125	81.6	87.0	77.2	9.8
25	*Sunday.*							
26	.934	.978	.892	.086	77.3	79.5	73.6	5.9
27	.890	.961	.819	.142	77.9	82.0	73.7	8.3
28	.826	.891	.761	.130	77.9	83.0	73.6	9.4
29	.825	.884	.768	.116	78.3	84.0	72.2	11.8
30	.844	.919	.790	.129	79.5	87.1	74.6	12.5
31	.831	.903	.770	.133	80.0	86.8	75.2	11.6

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived, from the twenty-four hourly observations made, during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1857.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	77.1	6.4	73.9	9.6	0.824	8.83	3.17	0.74
2	79.0	5.9	76.0	8.9	.882	9.43	.06	.76
3	78.7	5.8	75.8	8.7	.876	.37	2.98	.76
4	*Sunday.*							
5	79.2	5.6	76.4	8.4	.893	.56	.90	.77
6	77.8	4.3	75.6	6.5	.871	.35	.16	.81
7	77.5	4.2	75.4	6.3	.865	.32	.05	.82
8	78.1	4.7	75.7	7.1	.873	.38	.37	.80
9	78.0	3.2	76.4	4.8	.893	.62	1.59	.86
10	78.5	4.5	76.2	6.8	.887	.52	2.30	.81
11	*Sunday.*							
12	78.2	4.8	75.8	7.2	.876	.41	.41	.80
13	77.0	5.9	74.0	8.9	.827	8.88	.91	.75
14	75.3	6.9	71.8	10.4	.771	.28	3.26	.72
15	75.3	6.6	72.0	9.9	.776	.33	.11	.73
16	76.6	6.3	73.4	9.5	.811	.69	.10	.74
17	78.0	4.9	75.5	7.4	.868	9.33	2.46	.79
18	*Sunday.*							
19	76.7	7.4	73.0	11.1	.801	8.57	3.64	.70
20	74.1	7.6	70.3	11.4	.734	7.90	.47	.70
21	72.9	7.2	69.3	10.8	.711	.66	.18	.71
22	73.2	7.2	69.6	10.8	.717	.73	.21	.71
23	74.5	6.4	71.3	9.6	.758	8.16	2.94	.74
24	75.8	5.8	72.9	8.7	.797	.57	.77	.76
25	*Sunday.*							
26	73.7	3.6	71.9	5.4	.773	.40	1.58	.84
27	74.0	3.9	72.0	5.9	.776	.40	.76	.83
28	72.9	5.0	70.4	7.5	.736	7.97	2.19	.78
29	72.4	5.9	69.4	8.9	.713	.72	.56	.75
30	73.1	6.4	69.9	9.6	.725	.82	.84	.73
31	72.7	7.3	69.0	11.0	.704	.59	3.22	.70

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.874	29.967	29.773	0.194	79.0	82.9	74.9	8.0
1	.865	.950	.763	.187	78.8	82.9	74.4	8.5
2	.855	.948	.759	.189	78.1	82.6	73.9	8.7
3	.851	.945	.755	.190	77.8	82.4	73.5	8.9
4	.857	.959	.753	.206	77.4	82.2	72.9	9.3
5	.867	.972	.748	.224	77.1	81.8	72.3	9.5
6	.883	.972	.766	.206	76.9	81.4	72.2	9.2
7	.906	.993	.782	.211	77.8	83.1	73.1	10.0
8	.928	30.024	.801	.223	80.6	86.0	73.6	12.4
9	.937	.040	.800	.240	82.3	87.0	75.0	12.0
10	.935	.038	.795	.243	83.7	88.8	77.0	11.8
11	.914	.016	.778	.238	85.1	88.7	77.7	11.0
Noon.	.888	29.990	.758	.232	86.2	89.4	79.2	10.2
1	.858	.963	.729	.234	86.9	90.3	79.1	11.2
2	.834	.954	.704	.250	87.0	90.9	79.5	11.4
3	.816	.925	.686	.239	87.1	91.8	79.3	12.5
4	.817	.921	.698	.223	86.0	91.2	79.2	12.0
5	.816	.914	.685	.229	84.9	89.7	78.0	11.7
6	.823	.919	.681	.238	83.1	87.2	77.4	9.8
7	.846	.939	.718	.221	81.8	86.0	76.8	9.2
8	.869	.953	.745	.208	81.1	84.9	76.8	8.1
9	.882	.971	.771	.200	80.4	84.5	76.2	8.3
10	.885	.973	.780	.193	79.9	84.0	76.0	8.0
11	.880	.976	.776	.200	79.4	82.8	75.8	7.0

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Mid-night.	75.9	3.1	74.3	4.7	0.835	9.03	1.47	0.86
1	75.7	3.1	74.1	4.7	.830	8.98	.46	.86
2	75.2	2.9	73.7	4.4	.819	.89	.33	.87
3	75.0	2.8	73.6	4.2	.817	.86	.27	.88
4	74.8	2.6	73.5	3.9	.814	.83	.18	.88
5	74.6	2.5	73.3	3.8	.809	.77	.15	.88
6	74.4	2.5	73.1	3.8	.803	.72	.14	.88
7	74.8	3.0	73.3	4.5	.809	.75	.38	.86
8	75.4	5.2	72.8	7.8	.795	.57	2.44	.78
9	75.8	6.5	72.5	9.8	.787	.46	3.12	.73
10	76.3	7.4	72.6	11.1	.790	.47	.60	.70
11	76.7	8.4	72.5	12.6	.787	.41	4.16	.67
Noon.	76.9	9.3	72.2	14.0	.781	.31	.68	.64
1	77.1	9.8	72.2	14.7	.781	.29	.96	.63
2	76.7	10.3	71.5	15.5	.763	.11	5.18	.61
3	76.7	10.4	71.5	15.6	.763	.11	.22	.61
4	76.5	9.5	71.7	14.3	.768	.19	4.72	.63
5	76.3	8.6	72.0	12.9	.776	.28	.21	.66
6	76.4	6.7	73.0	10.1	.801	.58	3.28	.72
7	76.4	5.4	73.7	8.1	.819	.82	2.58	.77
8	76.5	4.6	74.2	6.9	.832	.96	.21	.80
9	76.2	4.2	74.1	6.3	.830	.96	1.98	.82
10	76.1	3.8	74.2	5.7	.832	.98	.80	.83
11	75.7	3.7	73.8	5.6	.822	.87	.75	.84

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1857.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	140.0	..	N. & Calm.	Cloudless.
2	140.0	0.20	N. & N. W.	Cloudless till 9 A. M. Scatd. ⌒i till 3 P. M. cloudless till 9 P. M. cloudy and raining from 10 P. M. to 11 P. M.
3	128.4	..	N. & N. W.	Cloudless till 7 A. M. Scatd. ⌒i till 7 P. M. cloudless afterwards.
4	*Sunday.*			
5	147.0	..	Calm & N. W.	Cloudy till 3 A. M. cloudless till 9 A. M. various clouds afterwards.
6	110.0	0.07	S. W. & N. W. & E.	Cloudy the whole day. Also slightly drizzling between 2 and 5 P. M.
7	129.0	0.14	N. E. & E.	Scatd. clouds till 6 P. M. cloudless afterwards. Also little rain at 4 P. M.
8	131.7	..	N.	Cloudless till 5 A. M. Scatd. ⌒i till 6 P. M. cloudless afterwards.
9	132.0	0.15	S. & N.	Cloudless till 2 A. M. Scatd. clouds afterwards. Also drizzling between 7 and 10 A. M.
10	134.6	..	S. W. & Calm.	Cloudless till 7 A. M. Scatd. ⌒i till 6 P. M. cloudless afterwards.
11	*Sunday.*	0.89		
12	139.0	..	N. & Calm.	Scattered \—i till 8 A. M. cloudy till 6 P. M. cloudless afterwards.
13	142.0	..	N. E.	Cloudless till 4 A. M. Scatd. \—i till 7 P. M. cloudless afterwards.
14	140.0	..	N. W. & Calm.	Cloudless.
15	135.8	..	Calm & N. W. & N.	Cloudless.
16	135.4	..	N. E.	Cloudless till 10 A. M. Scatd. ⌒i till 4 P. M. cloudless afterwards.
17	138.0	..	Calm & S. E. & W.	Cloudless till 4 A. M. Scatd. \—i till 10 A. M. scattered clouds till 7 P. M. cloudless afterwards, also very slightly drizzling at 7 P. M.
18	*Sunday.*			
19	141.0	..	N. W. & N. & W.	Scatd. clouds till 5 A. M. cloudless till 10 A. M. Scatd. ⌒i till 5 P. M. cloudless afterwards.
20	142.0	..	N. & Calm.	Cloudless till 10 A. M. Scatd. ⌒i till 2 P. M. cloudless afterwards.
21	134.6	..	N. & Calm.	Cloudless till 9 A. M. Scatd. ⌒i till 2 P. M. cloudless afterwards.
22	140.0	..	N. & S. E. & N. E.	Cloudless.

\i Cirri, \—i cirro strati, ⌒i cumuli, ⌒—i cumulo strati, \⌒—i nimbi, —i strati, \⌒i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1857.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
23	127.0	..	N. E. & Calm & S. W.	Cloudless till 6 A. M. Scatd. \i & _i till 1 P. M. Scatd. ⌒i till 6 P. M. cloudless afterwards.
24	133.0	..	S. & S. W.	Cloudless till 8 A. M. Scatd. ⌒i till 6 P. M. cloudless afterwards.
25	*Sunday.*			
26	..	0.15	N. E. & S.	Cloudy. Also drizzling between 3 and 8 A. M.
27	..	..	N. & N. E. & E.	Cloudy.
28	124.0	..	N. W. & N. E. & N.	Cloudless till 5 A. M. Scatd. _i till 3 P. M. cloudless afterwards.
29	134.0	..	N. & Calm.	Scatd. thin clouds till 5 A. M. Scatd. _i afterwards.
30	139.5	..	N.	Cloudy.
31	139.0	..	N. & N. W.	Scatd. clouds till 7 A. M. Scatd. \i & _i afterwards.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1857.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.870
Max. height of the Barometer, occurred at 9 A. M. on the 14th, ..	30.040
Min. height of the Barometer, occurred at 6 P. M. on the 1st, ..	29.681
Extreme Range of the Barometer during the month, ...	0.359
Mean of the Daily Max. Pressures, ...	29.938
Ditto ditto Min. ditto, ...	29.810
Mean Daily range of the Barometer during the month, ...	0.128

	o
Mean Dry Bulb Thermometer for the month, ...	81.6
Max. Temperature, occurred at 3 P. M. on the 5th, ...	91.8
Min. Temperature, occurred at 6 A. M. on the 29th, ...	72.2
Extreme Range of the Temperature during the month, ...	19.6
Mean of the Daily Max. Temperatures, ...	87.6
Ditto ditto Min. ditto, ...	76.7
Mean Daily range of the Temperature during the month, ...	10.9

	o
Mean Wet Bulb Thermometer for the month, ...	75.9
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	5.7
Computed Mean Dew Point for the month, ...	73.0
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	8.6
	Inches.
Mean Elastic force of vapour for the month, ...	0.801

	Troy grains.
Mean weight of vapour for the month, ...	8.60
Additional weight of vapour required for complete saturation, ..	2.74
Mean degree of Humidity for the month, complete saturation being unity,	0.76

	Inches.
Rained 7 days. Max. fall of rain during 24 hours, ...	0.89
Total amount of rain during the month, ...	1.60
Prevailing direction of the Wind, ...	N. & N. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1857.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	10		1		1				1		2		1				11		
1	9		1		1				1		2		2				10		1
2	9		2		1				1		2		2				10		
3	9		2		2				1	1	2		1				9		1
4	9		2		2				1	1	2		1				9		1
5	9		1		2		1		1	1	1		1		1		8		2
6	11		1		1		1						3	1	3		7		
7	11		4	1			2	1	1				1		4		4		
8	16	1	3		1				1	1	1		2		2		1		
9	13		7		1				1	1	1		1		3				
10	10		6		3						2	1			6				
11	8		8		3						2		1		5				
Noon.	7		9		1						3				7				
1	6		7		1						2		1		10				
2	4		6		2		1				3	1	1		10				
3	8		3		3				2		2		3		6				
4	9		2		1	1	4		1		2				7				1
5	10		3	1	1		2		4		1				6				
6	9		3		1		4		3						6		1		
7	8		3		1		2	1	3		2				6		2		
8	8		3		1		2		3		2				5		3		
9	7		3		1		2		2		3		1		4		4		
10	7		3		1		2		2		3		1		4		4		
11	8		2		1		2		2		4	1	1		3		4		

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1857.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	*Sunday.*							
2	29.882	29.940	29.828	0.112	79.5	87.5	72.8	14.7
3	.910	.975	.853	.122	79.0	86.8	73.6	13.2
4	.888	.974	.832	.142	75.5	83.2	69.0	14.2
5	.858	.932	.794	.138	76.1	85.0	69.4	15.6
6	.848	.930	.791	.139	75.2	84.7	67.4	17.3
7	.865	.936	.818	.118	73.6	82.2	65.6	16.6
8	*Sunday.*							
9	.986	30.080	.937	.143	71.7	81.4	62.8	18.6
10	.928	.003	.870	.133	72.3	81.6	64.8	16.8
11	.923	29.994	.873	.121	72.5	81.8	65.2	16.6
12	.994	30.071	.930	.141	72.1	82.6	64.0	18.6
13	30.051	.121	.998	.123	72.1	82.1	63.6	18.5
14	.045	.126	.962	.164	72.5	82.4	63.8	18.6
15	*Sunday.*							
16	.062	.145	30.004	.141	73.8	83.2	66.3	16.9
17	.048	.120	29.980	.140	74.2	82.8	67.2	15.6
18	.015	.083	.957	.126	73.2	81.2	66.1	15.1
19	.031	.107	.979	.128	70.5	79.7	63.2	16.5
20	.038	.131	.964	.167	69.6	79.6	61.0	18.6
21	.003	.079	.958	.121	70.4	79.4	62.6	16.8
22	*Sunday.*							
23	29.961	.035	.883	.152	71.5	81.3	63.6	17.7
24	.977	.052	.926	.126	71.2	80.8	64.0	16.8
25	.967	.051	.907	.144	71.1	80.0	63.2	16.8
26	.943	.014	.890	.124	71.4	81.6	62.6	19.0
27	.945	.019	.895	.124	72.4	79.2	67.4	11.8
28	.936	.011	.873	.138	71.9	79.5	66.8	12.7
29	*Sunday.*							
30	.976	.037	.923	.114	71.3	79.6	66.8	12.8

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1857.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	*Sunday.*							
2	73.2	6.3	70.0	9.5	0.727	7.84	2.82	0.74
3	72.2	6.8	68.8	10.2	.699	.56	.94	.72
4	67.8	7.7	63.9	11.6	.595	6.47	.99	.68
5	67.9	8.2	63.8	12.3	.593	.45	3.18	.67
6	66.1	9.1	61.5	13.7	.550	5.99	.38	.64
7	64.9	8.7	60.5	13.1	.532	.81	.12	.65
8	*Sunday.*							
9	64.7	7.0	61.2	10.5	.544	.97	2.46	.71
10	65.1	7.2	61.5	10.8	.550	6.02	.56	.70
11	65.1	7.4	61.4	11.1	.548	.00	.63	.70
12	64.1	8.0	60 1	12.0	.525	5.75	.78	.67
13	64.4	7.7	60.5	11.6	.532	.83	.70	.68
14	66.4	6.1	63.3	9.2	.584	6.39	.24	.74
15	*Sunday.*							
16	67.3	6.5	64 0	9.8	.597	.52	.46	.73
17	67.5	6.7	64.1	10.1	.599	.54	.55	.72
18	65.3	7.9	61.3	11.9	.546	5.97	.85	.68
19	63.2	7.3	59.5	11.0	.515	.65	.48	.70
20	62.4	7.2	58.8	10.8	.503	.53	.37	.70
21	63.9	6.5	60.6	9.8	.534	.86	.24	.72
22	*Sunday.*							
23	64.9	6.6	61.6	9.9	.552	6.05	.33	.72
24	63.8	7.4	60 1	11.1	.525	5.76	.54	.69
25	64.0	7.1	60.4	10.7	.530	.82	.46	.70
26	64.6	6.8	61.2	10.2	.544	.98	.37	.72
27	67.5	4.9	65.0	7.4	.617	6.77	1.83	.79
28	67.0	4.9	64.5	7 4	.607	.67	.81	.79
29	*Sunday.*							
30	65.0	6.3	61.8	9.5	.555	.09	2.24	.73

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.964	30.078	29.839	0.239	69.2	76.6	65.6	11.0
1	.957	.065	.840	.225	68.5	75.8	64.8	11.0
2	.948	.049	.835	.214	68.0	76.0	63.8	12.2
3	.946	.041	.831	.210	67.3	75.3	62.8	12.5
4	.940	.049	.828	.221	66.8	74.6	62.0	12.6
5	.949	.059	.841	.218	66.4	74.0	61.6	12.4
6	.970	.081	.856	.225	65.8	73.6	61.0	12.6
7	.996	.108	.881	.227	66.0	74.3	61.6	12.7
8	30.022	.126	.922	.204	69.7	77.9	64.2	13.7
9	.037	.145	.930	.215	73.1	80.6	69.6	11.0
10	.032	.141	.929	.212	75.8	81.9	71.8	10.1
11	.010	.126	.906	.220	78.3	83.2	74.2	9.0
Noon.	29.979	.083	.877	.206	80.2	85.6	76.6	9.0
1	.944	.050	.831	.219	81.3	86.6	78.4	8.2
2	.921	.023	.805	.218	81.9	87.5	78.6	8.9
3	.911	.018	.791	.227	81.7	87.3	78.8	8.5
4	.909	.005	.791	.214	79.7	85.4	76.8	8.6
5	.917	.012	.799	.213	77.9	84.5	75.0	9.5
6	.926	.026	.798	.228	75.5	82.5	72.5	10.0
7	.947	.049	.818	.231	73.7	80.8	70.4	10.4
8	.965	.065	.838	.227	72.3	79.8	69.4	10.4
9	.974	.071	.842	.229	71.4	79.0	68.3	10.7
10	.980	.079	.842	.237	70.6	78.0	67.3	10.7
11	.973	.082	.839	.243	69.8	77.6	66.9	10.7

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	65.1	4.1	63.0	6.2	0.578	6.37	1.44	0.82
1	64.7	3.8	62.8	5.7	.574	.33	.32	.83
2	64.3	3.7	62.1	5.9	.561	.19	.34	.82
3	64.0	3.3	62.0	5.3	.559	.19	.18	.84
4	63.5	3.3	61.5	5.3	.550	.10	.16	.84
5	63.0	3.4	61.0	5.4	.541	.00	.17	.84
6	62.5	3.3	60.5	5.3	.532	5.91	.13	.84
7	62.7	3.3	60.7	5.3	.536	.94	.14	.84
8	64.5	5.2	61.9	7.8	.557	6.13	.80	.77
9	65.9	7.2	62.3	10.8	.565	.17	2.62	.70
10	66.9	8.9	62.4	13.4	.567	.17	3.37	.65
11	67.4	10.9	61.9	16.4	.557	.03	4.25	.59
Noon.	67.8	12.4	61.6	18.6	.552	5.94	.94	.55
1	68.1	13.2	61.5	19.8	.550	.91	5.33	.53
2	68.2	13.7	61.3	20.6	.546	.86	.58	.51
3	68.1	13.6	61.3	20.4	.546	.88	.49	.52
4	67.5	12.2	61.4	18.3	.548	.92	4.80	.55
5	68.1	9.8	63.2	14.7	.582	6.30	3.86	.62
6	68.2	7.3	64.5	11.0	.607	.61	2.85	.70
7	67.5	6.2	64.4	9.3	.605	.62	.34	.74
8	66.8	5.5	64.0	8.3	.597	.54	.04	.76
9	66.3	5.1	63.7	7.7	.591	.44	1.91	.77
10	65.9	4.7	63.5	7.1	.588	.46	.69	.79
11	65.3	4.5	63.0	6.8	.578	.36	.59	.80

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1857.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	°	Inches.		
1	*Sunday.*			
2	140.0	..	W. & S. W. & N. E.	Cloudless till Noon, Scatd. ∩i till 4 P. M. Scatd. \—i afterwards.
3	138.0	..	N. W. & W.	Scatd. \—i till 5 P. M. cloudless afterwards.
4	133.0	..	N. W.	Cloudless till 11 A. M. Scatd. \i till 5 P. M. cloudless afterwards.
5	134.2	..	N. W. & N.	Cloudless.
6	137.0	..	N. & W. & N. W.	Cloudless.
7	132.5	..	N. W. & W.	Cloudless.
8	*Sunday.*			
9	129.3	..	N. W. & W. & calm.	Cloudless.
10	139.0	..	S. W. & calm.	Cloudless.
11	132.0	..	W. & calm.	Cloudless.
12	135.0	..	N. W. & S. W.	Cloudless.
13	131.5	..	N. W. & N.	Cloudless.
14	133.5	..	N. W. & N.	Cloudless till 1 A. M. Scatd. ∩i till 3 P. M. cloudless afterwards.
15	*Sunday.*			
16	133.5	..	N. W. & N.	Cloudless.
17	130.0	..	N. W.	Cloudless.
18	134.0	..	N. W. & N.	Cloudless.
19	132.0	..	N. W. & N. E.	Cloudless till 8 A. M. Scatd. \—i afterwards.
20	134.0	..	N. W. & N.	Cloudless.
21	129.0	..	N. & E.	Cloudless till 8 A. M. Scatd. \—i afterwards.
22	*Sunday.*			
23	132.0	..	N. E. & N. W.	Cloudless.
24	130.0	..	N.	Cloudless.
25	129.0	..	N. & N. W.	Cloudless.
26	135.0	..	N. E. & E. & N. W.	Cloudless.
27	135.0	..	E. & N. E.	Scatd. \—i till 11 A. M. cloudy afterwards. Also very slightly drizzling occasionally.
28	130.0	..	N.	Cloudy with very slight drizzling till 1 A. M. cloudless till 6 A. M. cloudy till 5 P. M. cloudless afterwards.
29	*Sunday.*			
30	125.0	..	W. & N. W.	Scatd. \—i till 4 A. M. cloudless afterwards.

\i Cirri, \—i Cirro strati, ∩i Cumuli, ∩—i Cumulo strati, \∩—i Nimbi, —i Strati, \∩ i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1857.

MONTHLY RESULTS.

	Inches.
Mean height of the Barometer for the month, ...	29.963
Max. height of the Barometer occurred at 9 A. M. on the 16th, ..	30.145
Min. height of the Barometer occurred at 3 & 4 P. M. on the 6th, ..	29.791
Extreme range of the Barometer during the month, ...	0.354
Mean of the Daily Max. Pressures, ...	30.039
Ditto ditto Min. ditto, ...	29.905
Mean Daily range of the Barometer during the month, ...	0.134

	o
Mean Dry Bulb Thermometer for the month, ...	73.0
Max. Temperature occurred at 2 P. M. on the 2nd, ...	87.5
Min. Temperature occurred at 6 A. M. on the 20th, ...	61.0
Extreme range of the Temperature during the month, ...	26.5
Mean of the Daily Max. Temperature, ...	82.0
Ditto ditto Min. ditto, ...	65.7
Mean Daily range of the Temperature during the month, ..	16.3

	o
Mean Wet Bulb Thermometer for the month, ...	65.9
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	7.1
Computed Mean Dew-point for the month, ...	62.3
Mean Dry Bulb Thermometer above computed mean Dew-point, ..	10.7
	Inches.
Mean Elastic force of Vapour for the month, ...	0.565

	Troy grains.
Mean Weight of Vapour for the month, ...	6.17
Additional Weight of Vapour required for complete saturation, ..	2.59
Mean degree of humidity for the month, complete saturation being unity,	0.70

	Inches.
Drizzled 2 days, Max. fall of rain during 24 hours, ...	Nil.
Total amount of rain during the month, ...	Nil.
Prevailing direction of the Wind, ...	N. W. & N.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1857.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	6		2		2	1					2		2		8		3		
1	7		2		1						2		2		8		3		
2	7		1		1						1		3		8		4		
3	7		1		1	1					1		3		7		4		1
4	8		2		1						1		3		7		3		
5	5		2		1						1		3		8		3		2
6	8		1		1	1					3		2		9		1		
7	8		2		1						2		1		10		1		
8	9				2								3		11				
9	7		2								1		4		11				
10	5		4		1								4		11				
11	5		3										5		12				
Noon.	5		4										3		13				
1	4		5		1						1		2		12				
2	6		2		1						1		2		13				
3	3				2						2		3		15				
4	5		1		1						3		3		12				
5	5		1		1	1	1				1		5		11				
6	6				2		1				1		4		11				
7	6		1		3						1		4		10				
8	5		1		3	1	1				1		4		10				
9	6		1		3	1	1				1		5		8				
10	6		1		3		1				1		4		7				2
11	6		1		3		1				1		5		8				

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1857.

On the 17th November, 1857, the Meteorological Observations after ten minutes intervals being taken at the Surveyor General's Office, they indicate the following circumstances :—

Exact Time of Minimum Barometer,	A. M. Between 2-30 (h.m.) & 3-20 (h.m.) during the whole of which interval the Barometer was stationary. P. M. 4-0 (h. m.)
Ditto of Maximum Barometer,......	A. M. 9-30 (h. m.) P. M. Between 10-30. (h. m.) & 11-0 (h. m.) during the whole of which interval the Barometer was stationary.
Ditto of Minimum Temperature,...	A. M. Between 6-30 (h. m.) & 7-0 (h. m.) during the whole of which interval the Thermoter was stationary.
Ditto of Maximum Temperature,...	P. M. Between 2-20 (h. m.) and 2-30 (h. m.) during the whole of which interval the Thermeter was stationary.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1857.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	30.022	30.096	29.975	0.121	70.5	77.8	65.0	12.8
2	.041	.125	.990	.135	69.8	77.9	63.6	14.3
3	.053	.137	30.000	.137	68.9	78.7	61.2	17.5
4	.084	.156	.033	.123	68.4	78.4	61.2	17.2
5	.078	.167	.000	.167	68.8	78.6	61.4	17.2
6	*Sunday.*							
7	29.981	.049	29.921	.128	67.5	77.8	61.0	16.8
8	.987	.065	.931	.134	68.1	78.3	61.6	16.7
9	30.030	.102	.969	.133	67.7	78.2	58.0	20.2
10	.052	.127	30.002	.125	68.4	79.6	59.6	20.0
11	.060	.138	.001	.137	67.3	78.6	58.9	19.7
12	.056	.160	29.988	.172	65.6	76.6	57.2	19.4
13	*Sunday.*							
14	.002	.081	.941	.140	66.2	77.4	57.6	19.8
15	.004	.074	.936	.138	65.9	77.6	56.8	20.8
16	29.992	.068	.917	.151	65.8	76.8	56.2	20.6
17	30.028	.092	.965	.127	67.1	76.8	59.6	17.2
18	.053	.125	.990	.135	67.3	77.2	59.4	17.8
19	.035	.127	.972	.155	67.1	77.6	58.8	18.8
20	*Sunday.*							
21	.017	.103	.963	.140	67.3	77.9	59.1	18.8
22	.020	.105	.961	.144	67.1	76.8	59.5	17.3
23	.000	.088	.943	.145	66.7	76.2	58.4	17.8
24	.006	.088	.952	.136	66.9	76.8	59.2	17.6
25	.059	.140	30.011	.129	67.0	78.2	57.8	20.4
26	.070	.153	.008	.145	66.2	76.3	58.2	18.1
27	*Sunday.*							
28	.080	.164	.021	.143	65.1	75.4	55.9	19.5
29	.103	.172	.043	.129	66.3	76.5	57.6	18.9
30	.079	.158	29.992	.166	68.2	78.0	60.7	17.3
31	.103	.191	30.039	.152	68.3	77.5	61.6	15.9

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived, from the twenty-four hourly observations made, during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1857.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	65.3	5.2	62.7	7.8	0.572	6.29	1.84	0.77
2	63.5	6.3	60.3	9.5	.528	5.81	2.14	.73
3	62.6	6.3	59.4	9.5	.513	.64	.10	.73
4	61.5	6.9	57.4	11.0	.480	.29	.33	.69
5	61.4	7.4	57.7	11.1	.485	.34	.37	.69
6	*Sunday.*							
7	61.2	6.3	57.4	10.1	.480	.30	.12	.71
8	61.2	6.9	57.1	11.0	.475	.24	.31	.69
9	60.1	7.6	55.5	12.2	.450	4.98	.48	.67
10	60.5	7.9	55.8	12.6	.455	5.02	.60	.66
11	60.0	7.3	55.6	11.7	.452	.00	.37	.68
12	58.7	6.9	54.6	11.0	.437	4.85	.15	.69
13	*Sunday.*							
14	60.0	6.2	56.3	9.9	.462	5.13	1.99	.72
15	59.2	6.7	55.2	10.7	.445	4.94	2.12	.70
16	59.4	6.4	55.6	10.2	.452	5.02	.02	.71
17	61.4	5.7	58.0	9.1	.489	.41	1.91	.74
18	61.7	5.6	58.3	9.0	.494	.46	.91	.74
19	61.6	5.5	58.3	8.8	.494	.46	.86	.75
20	*Sunday.*							
21	61.5	5.8	58.0	9.3	.489	.41	.96	.73
22	60.9	6.2	57.2	9.9	.476	.26	2.06	.72
23	60.6	6.1	56.9	9.8	.472	.21	.02	.72
24	60.8	6.1	57.1	9.8	.475	.25	.03	.72
25	60.5	6.5	56.6	10.4	.467	.17	.13	.71
26	60.1	6.1	56.4	9.8	.464	.14	1.98	.72
27	*Sunday.*							
28	59.1	6.0	55.5	9.6	.450	.00	.89	.73
29	60.9	5.4	57.7	8.6	.485	.36	.79	.75
30	62.2	6.0	58.6	9.6	.499	.51	2.07	.73
31	62.8	5.5	59.5	8.8	.515	.68	1.92	.75

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	30.044	30.113	29.975	0.138	63.3	67.8	60.2	7.6
1	.035	.105	.967	.138	62.7	66.5	59.2	7.3
2	.025	.095	.962	.133	62.1	66.2	58.7	7.5
3	.014	.086	.950	.136	61.5	66.1	57.8	8.3
4	.013	.086	.947	.139	60.7	65.8	57.1	8.7
5	.025	.098	.960	.138	60.3	65.5	56.4	9.1
6	.042	.112	.982	.130	59.7	65.1	56.2	8.9
7	.066	.133	30.007	.126	59.5	65.0	55.9	9.1
8	.097	.179	.034	.145	62.2	67.8	57.8	10.0
9	.119	.189	.049	.140	66.0	70.0	62.4	7.6
10	.117	.191	.046	.145	69.3	73.0	66.6	6.4
11	.098	.173	.028	.145	72.6	75.0	69.9	5.1
Noon.	.064	.132	.001	.131	75.2	76.9	72.8	4.1
1	.029	.097	29.963	.134	76.6	78.6	74.6	4.0
2	.002	.068	.932	.136	77.5	79.6	75.4	4.2
3	29.986	.048	.922	.126	76.9	78.6	75.0	3.6
4	.982	.039	.917	.122	75.1	77.0	73.0	4.0
5	.990	.053	.925	.128	73.1	75.2	71.4	3.8
6	30.000	.065	.937	.128	70.4	72.8	68.6	4.2
7	.020	.086	.958	.128	68.6	71.2	66.4	4.8
8	.038	.110	.971	.139	67.2	70.4	65.0	5.4
9	.052	.124	.985	.139	66.1	69.6	63.6	6.0
10	.061	.127	.987	.140	65.1	68.8	62.4	6.4
11	.056	.123	.980	.143	64.2	68.2	61.4	6.8

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Mid-night.	59.4	3.9	56.7	6.6	0.469	5.22	1.29	0.80
1	59.0	3 7	56.4	6.3	.464	.18	.21	.81
2	58.5	3.6	56.0	6.1	.458	.12	.15	.82
3	58.1	3.4	55.7	5 8	.453	.07	.09	.82
4	57.3	3.4	54.6	6.1	.437	4.90	.10	.82
5	57.1	3.2	54.5	5.8	.435	.88	.05	.82
6	56.8	2.9	54.5	5.2	.435	.89	0.93	.84
7	56.7	2.8	54.5	5.0	.435	.89	.89	.85
8	58.6	3.6	56.1	6.1	.459	5.14	1.15	.82
9	60.5	5.5	57.2	8.8	.476	.27	.81	.74
10	62.2	7.1	58.6	10.7	.499	.50	2.33	.70
11	63.6	9.0	59.1	13.5	.508	.55	3.11	.64
Noon.	64.3	10.9	58.8	16.4	.503	.47	.90	.58
1	64.7	11.9	58.7	17.9	.501	.44	4.33	.56
2	64.9	12.6	58.6	18.9	.499	.41	.63	.54
3	64.1	12.8	57.7	19.2	.485	.25	.61	.53
4	63.5	11.6	57.7	17.4	.485	.27	.07	.56
5	63.8	9.3	59.1	14.0	.508	.55	3.24	.63
6	63.8	6.6	60.5	9.9	.532	.85	2.25	.72
7	63.0	5.6	60.2	8.4	.527	.82	1.85	.76
8	62.2	5.0	59.2	8.0	.509	.64	.71	.77
9	61.5	4.6	58.7	7.4	.501	.56	.54	.78
10	61.0	4.1	58.5	6.6	.498	.52	.37	.80
11	60.3	3.9	57.6	6.6	.483	.36	.33	.80

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1857.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	126.4	..	N. W. & N.	Scatd. ⌒i till 5 A. M. cloudless till 9 A. M. Scatd. ⌒i till 4 P. M. cloudless afterwards.
2	127.0	..	N. W. & N. [Calm.	Cloudless.
3	131.0	..	N. W. & N. E. &	Cloudless.
4	130.0	..	N. W. & N.	Cloudless. Also foggy between Midnight and 3 A. M.
5	132.0	..	N. W.	Cloudless.
6	*Sunday.*			
7	131.0	..	N. W. & N.	Cloudless.
8	128.0	..	N. W. & N.	Cloudless.
9	128.0	..	N. W. & N.	Cloudless.
10	137.0	..	N. & N. W.	Cloudless.
11	133.0	..	N. W. & N.	Cloudless. [7 P. M. and 11 P. M.
12	136.0	..	N. & N. W.	Cloudless, also slightly foggy between
13	*Sunday.*			
14	131.0	..	S. W. & W. & N.	Cloudless, also slightly foggy between 8 P. M. and 11 P. M.
15	128.0	..	W. & S. W. & S.	Cloudless, also foggy between Midnight and 8 A. M. [P. M.
16	133.5	..	S. E. & S. W. & E.	Cloudless; also foggy between 9 and 11
17	130.2	..	N. E. & W.	Cloudless, also foggy between 8 and 11 P. M.
18	131.4	..	N.	Cloudless.
19	128.0	..	N. W. & N.	Cloudless.
20	*Sunday.*			
21	128.0	..	N. W. & N.	Cloudless.
22	132.4	..	N. W.	Cloudless. Also foggy between 7 and 10 P. M. [7 and 10 P. M.
23	128.4	..	N. E. & W. & N. W.	Cloudless. Also slightly foggy between
24	130.0	..	W. & N. W.	Cloudless. [and Midnight.
25	132.0	..	N. W. & N.	Cloudless. Also foggy between 7 P. M.
26	128.0	..	N. & W.	Cloudless. Also foggy between 8 P. M. and Midnight.
27	*Sunday.*			
28	129.0	..	N. W. & N. E.	Cloudless. Also slightly foggy between Midnight and 2 A. M.
29	126.0	..	W. & N.	Cloudless till 6 A. M. Scatd. ⌞i till 9 A. M. cloudless till 7 P. M. Scatd. ⌞i afterwards. [wards.
30	127.0	..	W. & N. & N. W.	Cloudless till 3 P. M. Scatd. ⌞i after-
31	128.0	..	N. W. & N.	Cloudless till 1 P. M. cloudy till 6 P. M. Scatd. ⌞i afterwards.

\i Cirri, ⌞i cirro strati, ⌒i cumuli, ⌒-i cumulo strati, \⌒-i nimbi, —i strati \⌒i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1857.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	30.041
Max. height of the Barometer, occurred at 10 A. M. on the 31st, ..	30.191
Min. height of the Barometer, occurred at 4 P. M. on the 16th, ..	29.917
Extreme Range of the Barometer during the month, ...	0.274
Mean of the Daily Max. Pressures, ...	30.120
Ditto ditto Min. ditto, ...	29.980
Mean Daily range of the Barometer during the month, ...	0.140

	o
Mean Dry Bulb Thermometer for the month, ...	67.4
Max. Temperature, occurred at 2 P. M. on the 10th, ...	79.6
Min. Temperature, occurred at 7 A. M. on the 28th, ...	55.9
Extreme Range of the Temperature during the month, ...	23.7
Mean of the Daily Max. Temperatures, ...	77.5
Ditto ditto Min. ditto, ...	59.4
Mean Daily range of the Temperature during the month, ...	18.1

	o
Mean Wet Bulb Thermometer for the month, ...	61.1
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	6.3
Computed Mean Dew Point for the month, ...	57.3
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	10.1
	Inches.
Mean Elastic force of vapour for the month, ...	0.478

	Troy grains.
Mean weight of vapour for the month, ...	5.28
Additional weight of vapour required for complete saturation, ..	2.11
Mean degree of Humidity for the month, complete saturation being unity,	0.71

	Inches.
Rained No days. Max. fall of rain during 24 hours, ...	Nil.
Total amount of rain during the month, ...	Nil
Prevailing direction of the Wind, ...	N. W. & N.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1857.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	4		1								1		6		11		3		1
1	5		2								1		6		12		1		
2	5		2								1		3		14		2		
3	5		2						1		1		2		14		1		1
4	6		2						1		1		3		13				1
5	6		1						1		2		3		13				1
6	6		3						2		1		3		12				
7	6		3						2		1		1		14				
8	8		1		1						2		3		11				1
9	7		4		2						2		3		9				
10	6		4		4						2		2		9				
11	8		4		2				1		1		1		10				
Noon.	6		4		2				1		1		3		10				
1	5		3		2						2		4		11				
2	4		3		1						4		4		11				
3	5		3		1						4		4		10				
4	8		1		1						1		8		8				
5	7		2		1		1				2		5		9				
6	9		1				1				1		4		10		1		
7	9		1				1				1		5		8		2		
8	8		1				1				1		4		8		4		
9	7		1				1				1		4		8		5		
10	7						1				1		5		8		4		1
11	7				1		1				1		6		8		3		

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1857.

On the 24th December, 1857, the Meteorological Observations after ten minutes intervals being taken at the Surveyor General's Office, they indicate the following circumstances :—

Exact Time of Minimum Barometer,	h. m. A. M. 4-40. P. M. 3-40.
Ditto of Maximum Barometer, ...	h. m. h. m. A. M. Between 9-40. & 10-0 during which time the Barometer was stationary. P. M. Between 9-40 & 9-50 during which time the Barometer was stationary.
Ditto of Minimum Temperature,...	A. M. Between 7-10 & 7-20 during which time the Thermometer was stationary.
Ditto of Maximum Temperature,...	P. M. Between 1-50 & 2-20 during which time the Thermometer was stationary.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	30.090	30.181	30.018	0.163	68.5	77.6	60.6	17.0
2	.025	.107	29.940	.167	68.1	77.4	60.8	16.6
3	*Sunday.*							
4	.011	.111	.948	.163	67.0	76.6	59.6	17.0
5	29.986	.062	.932	.130	67.7	78.5	60.4	18.1
6	.998	.071	.938	.133	66.1	76.7	58.6	18.1
7	30.009	.114	.942	.172	66.6	77.2	57.6	19.6
8	29.992	.084	.936	.148	66.6	77.7	58.4	19.3
9	.971	.063	.917	.146	65.9	76.6	56.6	20.0
10	*Sunday.*							
11	.957	.031	.881	.150	69.2	80.6	60.8	19.8
12	.936	.019	.878	.141	67.6	78.1	59.4	18.7
13	.966	.064	.912	.152	65.2	75.4	56.8	18.6
14	.966	.051	.896	.155	64.9	76.6	56.6	20.0
15	.983	.084	.911	.173	66.2	78.4	56.2	22.2
16	.988	.081	.943	.138	66.7	79.2	57.5	21.7
17	*Sunday.*							
18	.922	.005	.865	.140	72.2	84.0	63.8	20.2
19	.910	29.984	.856	.128	72.9	83.8	65.0	18.8
20	.958	30.038	.886	.152	69.4	75.4	64.6	10.8
21	.873	29.955	.812	.143	69.9	79.2	64.2	15.0
22	.879	.940	.841	.099	66.7	74.8	61.4	13.4
23	.990	30.092	.902	.190	64.8	75.4	56.4	19.0
24	*Sunday.*							
25	30.040	.111	.978	.133	68.1	79.3	58.4	20.9
26	.062	.138	.976	.162	69.9	80.2	61.0	19.2
27	.075	.164	30.010	.154	69.1	79.2	62.0	17.2
28	.073	.140	.019	.121	70.3	79.4	62.4	17.0
29	.064	.136	.009	.127	71.3	79.6	65.2	14.4
30	.112	.208	.057	.151	69.4	77.6	63.0	14.6
31	*Sunday.*							

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	63.1	5.4	60.4	8.1	0.530	5.85	1.80	0.77
2	62.4	5.7	59.0	9.1	.506	.59	.96	.74
3	*Sunday.*							
4	61.6	5.4	58.4	8.6	.496	.48	.82	.75
5	61.5	6.2	57.8	9.9	.486	.37	2.09	.72
6	59.5	6.6	55.5	10.6	.450	4.99	.11	.70
7	60.5	6.1	56.8	9.8	.470	5.20	.01	.72
8	60.2	6.4	56.4	10.2	.464	.14	.07	.71
9	59.3	6.6	55.3	10.6	.447	4.96	.10	.70
10	*Sunday.*							
11	63.8	5.4	61.1	8.1	.543	5.98	1.83	.77
12	60.6	7.0	56 4	11.2	.464	.12	2.32	.69
13	56.9	8.3	51.9	13.3	.398	4.43	.48	.64
14	57.1	7.8	52.4	12.5	.405	.50	.35	.66
15	58.5	7.7	53 9	12.3	.426	.73	.39	.66
16	59.2	7.5	54.7	12.0	.438	.85	.38	.67
17	*Sunday.*							
18	66.1	6.1	63.0	9.2	.578	6.33	.22	.74
19	66.6	6.3	63.4	9.5	.586	.40	.33	.73
20	63.9	5.5	61.1	8.3	.543	5.98	1.88	.76
21	62.8	7.1	59.2	10.7	.509	.60	2.38	.70
22	58.4	8.3	53.4	13.3	.419	4.65	.58	.64
23	56.8	8.0	52.0	12.8	.400	.44	.39	.65
24	*Sunday.*							
25	61.7	6.4	57.9	10.2	.488	5.38	.17	.71
26	63.0	6.9	59.5	10.4	.515	.66	.32	.71
27	63.5	5.6	60.7	8.4	.536	.90	1.88	.76
28	63.9	6.4	60.7	9.6	.536	.88	2.20	.73
29	65.4	5.9	62.4	8.9	.567	6.22	.11	.75
30	61.2	8.2	57.1	12.3	.475	5.23	.63	.67
31	*Sunday.*							

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.994	30.109	29.861	0.248	64.1	69.0	59.3	9.7
1	.989	.102	.859	.243	63.5	68.1	58.5	9.6
2	.977	.095	.845	.250	62.9	67.8	57.8	10.0
3	.969	.089	.841	.248	62.3	67.5	57.1	10.4
4	.973	.080	.865	.215	61.5	67.0	56.6	10.4
5	.976	.087	.846	.241	61.3	66.0	56.7	9.3
6	.993	.107	.863	.244	60.7	65.5	56.6	8.9
7	30.015	.125	.872	.253	60.4	65.4	56.2	9.2
8	.046	.152	.908	.244	62.3	68.2	58.5	9.7
9	.071	.195	.930	.265	66.3	69.8	63.2	6.6
10	.077	.208	.940	.268	69.8	73.1	66.8	6.3
11	.056	.189	.923	.266	73.2	76.8	70.2	6.6
Noon.	.023	.170	.903	.267	75.4	80.1	72.2	7.9
1	29.990	.123	.873	.250	77.1	82.2	73.8	8.4
2	.963	.095	.838	.257	77.8	83.4	73.6	9.8
3	.943	.072	.824	.248	77.8	84.0	72.0	12.0
4	.935	.062	.812	.250	76.2	82.2	72.4	9.8
5	.942	.062	.822	.240	74.4	80.6	70.4	10.2
6	.951	.075	.834	.241	71.6	77.2	68.0	9.2
7	.968	.095	.825	.270	69.5	75.1	65.8	9.3
8	.988	.110	.846	.264	67.8	73.2	64.0	9.2
9	30.001	.127	.858	.269	66.5	72.6	62.4	10.2
10	.007	.149	.864	.285	65.5	72.0	61.2	10.8
11	.002	.144	.865	.279	64.8	71.6	60.4	11.2

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hour during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	60.3	3.8	57.6	6.5	0.483	5.36	1.31	0.80
1	60.0	3.5	57.5	6.0	.481	.36	.19	.82
2	59.6	3.3	57.3	5.6	.478	.33	.10	.83
3	59.2	3.1	57.0	5.3	.473	.29	.02	.84
4	58.5	3.0	56.4	5.1	.464	.19	0.97	.84
5	58.4	2.9	56.1	5.2	.459	.15	.97	.84
6	57.8	2.9	55.5	5.2	.450	.05	.95	.84
7	57.5	2.9	55.2	5.2	.445	.00	.95	.84
8	58.9	3.4	56.5	5.8	.465	.20	1.11	.82
9	60.6	5.7	57.2	9.1	.476	.27	.88	.74
10	61.8	8.0	57.8	12.0	.486	.35	2.60	.67
11	62.8	10.4	57.6	15.6	.483	.27	3.55	.60
Noon.	63.8	11.6	58.0	17.4	.489	.32	4.11	.56
1	64.4	12.7	58.0	19.1	.489	.30	.62	.53
2	64.8	13.0	58.3	19.5	.494	.34	.79	.53
3	64.8	13.0	58.3	19.5	.494	.34	.79	.53
4	64.1	12.1	58.0	18.2	.489	.31	.35	.55
5	64.0	10.4	58.8	15.6	.503	.47	3.68	.60
6	64.1	7.5	60.3	11.3	.528	.80	2.60	.69
7	63.1	6.4	59.9	9.6	.521	.73	.15	.73
8	62.2	5.6	58.8	9.0	.503	.55	1.93	.74
9	61.7	4.8	58.8	7.7	.503	.56	.63	.77
10	61.1	4.4	58.5	7.0	.498	.52	.46	.79
11	60.5	4.3	57.9	6.9	.488	.41	.42	.79

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	129.8	..	N. W.	Cloudless: also slightly foggy between Midnight and 6 A. M.
2	129.0	..	W. & N. E.	Cloudless: also foggy between 9 P. M. and Midnight.
3	*Sunday.*			
4	131.0	..	W. & S. W.	Cloudless: also foggy between Midnight and 7 A. M. also the same between 8 P. M. and Midnight.
5	135.0	..	S. W. & N. W.	Cloudless.
6	132.0	..	Calm & N. W. & W.	Cloudless.
7	132.0	..	N. W. & N. E. & N.	Cloudless till 11 A. M. Scatd. ⌒i and _i till 3 P. M. cloudless afterwards.
8	134.0	..	N. W. & N.	Cloudless.
9	130.0	..	N. W. & N. E.	Cloudless, also foggy between 9 & 11 P. M.
10	*Sunday.*			
11	136.2	..	S. W. & Calm.	Cloudless.
12	135.0	..	N. W. & Calm.	Cloudless.
13	135.0	..	N. W. & W.	Cloudless till 11 A. M. Scatd. \i & _i till 6 P. M. cloudless afterwards.
14	134.0	..	S. W. & Calm & W.	Cloudless till 6 A. M. Scatd. _i till 5 P. M. cloudless afterwards.
15	136.4	..	W. & S. W. & N. W.	Cloudless till 5 A. M. Scatd. _i till 3 P. M. cloudless afterwards.
16	133.4	..	Calm & W.	Cloudless till 4 A. M. Scatd. _i till 5 P. M. cloudless afterwards: also foggy between 9 & 11 P. M.
17	*Sunday.*			
18	139.0	..	S. & S. W.	Cloudless: also foggy between 4 & 8 A. M.
19	134.0	..	S. W. & S.	Cloudless till 8 P. M. cloudy afterwards; also slightly drizzling between 9 & 10 P. M.
20	..	..	Variable.	Cloudy; likewise slightly raining between 4 & 5 P. M. & also between 8 & 9 P. M.
21	132.0	0.07	S. W.	Cloudy; also slightly drizzling at 5 P. M.
22	128.5	..	N. W.	Cloudless.
23	134.0	..	Calm & N. E. & E.	Cloudless; also slightly foggy between 7 & 11 P. M.
24	*Sunday.*			
25	136.0	..	S.	Cloudless.

\i Cirri, _i Cirro strati, ⌒i Cumuli, ⌒_i Cumulo strati, \⌒_i Nimbi, —i Strati \⌒ i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
26	134.0	..	S. E. & N. E.	Cloudless till 5 A. M. Scatd. \—i till 10 A. M. cloudless till 6 P. M. Scatd. \—i afterwards.
27	128.0	..	N. E. & N. W.	Scatd. \—i.
28	125.4	..	N. W. & N. & N. E.	Scatd. \—i & ⌒i.
29	133.0	..	W. & N. W. & Calm.	Scatd. \—i till 5 A. M. cloudy till 9 A. M. Scatd. \—i & ⌒i till 6 P. M. cloudless afterwards.
30	134.5	..	N. W. & W. & E.	Cloudless.
31	*Sunday.*			

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1858.

Monthly Results.

		Inches.
Mean height of the Barometer for the month,	.. ..	29.994
Max. height of the Barometer occurred at 10 A. M. on the 30th,	..	30.208
Min. height of the Barometer occurred at 4 P. M. on the 21st,	..	29.812
Extreme range of the Barometer during the month,	.. ..	0.396
Mean of the Daily Max. Pressures,	.. .. ..	30.078
Ditto ditto Min. ditto,	.. .. ..	29.931
Mean Daily range of the Barometer during the month,	.. ..	0.147

		o
Mean Dry Bulb Thermometer for the month,	.. ..	68.1
Max. Temperature occurred at 3 P. M. on the 18th,	.. ..	84.0
Min. Temperature occurred at 7 A. M. on the 15th,	.. ..	56.2
Extreme range of the Temperature during the month,	.. ..	27.8
Mean of the Daily Max. Temperature,	.. .. ..	78.3
Ditto ditto Min. ditto,	.. .. ..	60.3
Mean Daily range of the Temperature during the month,	..	18.0

		o
Mean Wet Bulb Thermometer for the month,	.. ..	61.4
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,	..	6.7
Computed Mean Dew-point for the month,	.. .. ..	57.4
Mean Dry Bulb Thermometer above computed mean Dew-point,	..	10.7
		Inches.
Mean Elastic force of Vapour for the month,	.. ..	0.480

		Troy grains.
Mean Weight of Vapour for the month,	.. .. ..	5.29
Additional Weight of Vapour required for complete saturation,	..	2.26
Mean degree of humidity for the month, complete saturation being unity,		0.70

		Inches.
Rained 3 days, Max. fall of rain during 24 hours,	.. ..	0.07
Total amount of rain during the month,	.. .. ..	0.07
Prevailing direction of the Wind,	.. ..	N. W. & S. W. & W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1858.

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	1		3				1		3		3		2		4		9		
1	1		2		1		1		3		4		3		4		7		
2	1		1		1				3		4		4		4		6		2
3	1		2				1		3		4		3		5		7		
4	1		2				1		2		3		3		5		7		2
5	1		2				1		3		3		5		3		6		2
6	1		2		1				3		3		5		6		5		
7	2		3		2				3		3		2		8		3		
8	3		3		3		1		3		2		1		8		2		
9	2		5		2		1		1		4		1		9		1		
10	3		5				2		1		1		4		10				
11	4		4				1		3		1		5		8				
Noon.	2		3		1		1		1		3		8		7				
1	3		1		1				2		4		6		9				
2	1		1				2				7		5		10				
3	1						1		1		5		7		11				
4	2				1		1		1		5		7		9				
5	3						1		2		4	1	5	1	10		1		
6	2		3				1		2		5		3		8		2		
7	1		3		2		1		2		6		3		5		3		
8			3		2		1		3		5		2		5		5		
9			3		2				3		6	1	2		5		5		
10			3		2		1	1	3		5		2		5		5		
11			3		2		1		3		5		2		5		5		

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.993	30.077	29.919	0.158	69.8	81.2	59.0	22.2
2	.959	.032	.873	.159	70.7	81.4	62.1	19.3
3	30.028	.124	.979	.145	68.9	78.6	61.7	16.9
4	29.988	.058	.917	.141	68.0	79.4	56.8	22.6
5	.955	.026	.874	.152	71.3	82.6	61.0	21.6
6	.970	.061	.924	.137	73.1	81.8	64.6	17.2
7	*Sunday.*							
8	30.061	.142	30.007	.135	66.6	74.1	61.6	12.5
9	.046	.140	29.981	.159	65.1	75.5	55.0	20.5
10	.020	.102	.964	.138	67.2	77.4	57.2	20.2
11	29.986	.056	.932	.124	67.3	77.6	61.0	16.6
12	.943	.033	.869	.164	70.0	80.0	62.6	17.4
13	.950	.035	.900	.135	71.7	79.2	67.0	12.2
14	*Sunday.*							
15	.950	.029	.886	.143	68.4	79.4	58.8	20.6
16	.977	.046	.923	.123	69.5	80.6	59.4	21.2
17	30.023	.108	.969	.139	71.2	83.5	62.0	21.5
18	.018	.097	.959	.138	71.5	83.4	60.4	23.0
19	29.972	.049	.912	.137	72.7	84.9	61.2	23.7
20	.945	.018	.874	.144	75.2	85.5	66.2	19.3
21	*Sunday.*							
22	30.000	.084	.949	.135	76.3	86.0	69.6	16.4
23	.015	.112	.945	.167	73.4	84.2	63.6	20.6
24	29.969	.059	.886	.173	72.8	85.6	60.8	24.8
25	.921	29.999	.842	.157	74.8	86.9	65.0	21.9
26	.898	.982	.826	.156	73.6	82.8	66.7	16.1
27	.886	.977	.821	.156	74.5	85.9	65.2	20.7
28	*Sunday.*							
..	....	....	....	....	....	....	....	....
..	....	....	....	....	....	....	....	....
..	....	....	....	....	....	....	....	....

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	61.3	8.5	57.0	12.8	0.473	5.20	2.75	0.65
2	62.4	8.3	58.2	12.5	.493	.41	.77	.66
3	60.2	8.7	55.8	13.1	.455	.02	.72	.65
4	59.0	9.0	53.6	14.4	.422	4.67	.86	.62
5	65.4	5.9	62.4	8.9	.567	6.22	.11	.75
6	67.8	5.3	65.1	8.0	.619	.78	.01	.77
7	*Sunday.*							
8	58.2	8.4	53.2	13.4	.416	4.62	.59	.64
9	57.5	7.6	52.9	12.2	.412	.59	.30	.67
10	59.3	7.9	54.6	12.6	.437	.83	.52	.66
11	62.7	4.6	59.9	7.4	.521	5.77	1.60	.78
12	66.5	3.5	64.7	5.3	.611	6.73	.27	.84
13	67.2	4.5	64.9	6.8	.615	.75	.68	.80
14	*Sunday.*							
15	60.5	7.9	55.8	12.6	.455	5.02	2.60	.66
16	59.4	10.1	54.3	15.2	.432	4.76	3.12	.60
17	62.1	9.1	57.5	13.7	.481	5.28	.02	.64
18	62.2	9.3	57.5	14.0	.481	.28	.10	.63
19	62.9	9.8	58.0	14.7	.489	.34	.34	.62
20	67.9	7.3	64.2	11.0	.601	6.54	2.83	.70
21	*Sunday.*							
22	67.6	8.7	63.2	13.1	.582	.32	3.37	.65
23	62.1	11.3	56.4	17.0	.464	5.06	.81	.57
24	62.2	10.6	56.9	15.9	.472	.15	.56	.59
25	65.3	9.5	60.5	14.3	.532	.80	.46	.63
26	64.9	8.7	60.5	13.1	.532	.81	.12	.65
27	66.3	8.2	62.2	12.3	.563	6.14	.04	.67
28	*Sunday.*							
..	....	....	....	....	....	....	....	....
..	....	....	....	....	....	....	....	....
..	....	....	....	....	....	....	....	....

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.984	30.051	29.886	0.165	66.4	72.4	61.2	11.2
1	.976	.045	.876	.169	65.5	71.6	58.8	12.8
2	.965	.028	.870	.158	64.8	71.4	58.0	13.4
3	.955	.029	.863	.166	64.3	71.1	56.6	14.5
4	.952	.036	.868	.168	63.8	70.4	58.8	11.6
5	.962	.040	.879	.161	63.1	70.2	55.6	14.6
6	.978	.069	.901	.168	62.4	70.0	55.2	14.8
7	30.005	.086	.935	.151	62.1	69.6	55.0	14.6
8	.033	.111	.957	.154	65.2	71.6	58.0	13.6
9	.053	.128	.977	.151	69.6	75.0	64.0	11.0
10	.060	.142	.977	.165	73.0	77.6	66.6	11.0
11	.044	.128	.963	.165	75.7	80.8	69.2	11.6
Noon.	.013	.101	.933	.168	78.3	83.2	71.2	12.0
1	29.978	.073	.892	.181	80.0	85.2	72.5	12.7
2	.950	.043	.856	.187	80.9	86.6	73.0	13.6
3	.929	.024	.838	.186	81.3	86.9	72.0	14.9
4	.921	.007	.821	.186	80.4	85.5	69.6	15.9
5	.922	.013	.821	.192	79.1	84.4	67.4	17.0
6	.928	.024	.824	.200	75.7	81.4	67.4	14.0
7	.945	.036	.839	.197	73.1	79.0	66.8	12.2
8	.967	.061	.865	.196	71.3	78.2	64.6	13.6
9	.979	.063	.874	.189	70.0	77.1	64.6	12.5
10	.985	.074	.880	.194	68.6	74.2	63.0	11.2
11	.985	.060	.876	.184	67.7	72.0	61.8	10.2

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	61.9	4.5	59.2	7.2	0.509	5.65	1.52	0.79
1	61.3	4.2	58.8	6.7	.503	.57	.41	.80
2	61.0	3.8	58.7	6.1	.501	.57	.26	.82
3	60.6	3.7	58.0	6.3	.489	.44	.28	.81
4	60.1	3.7	57.5	6.3	.481	.36	.25	.81
5	59.6	3.5	57.1	6.0	.475	.30	.17	.82
6	59.0	3.4	56.6	5.8	.467	.22	.11	.83
7	58.9	3.2	56.7	5.4	.469	.24	.03	.84
8	60.6	4.6	57.8	7.4	.486	.40	.51	.78
9	62.4	7.2	58.8	10.8	.503	.53	2.37	.70
10	63.4	9.6	58.6	14.4	.499	.46	3.30	.62
11	63.9	11.8	58.0	17.7	.489	.31	4.20	.56
Noon.	64.6	13.7	57.7	20.6	.485	.23	5.05	.51
1	65.3	14.7	57.9	22.1	.488	.25	.56	.49
2	65.8	15.1	58.2	22.7	.493	.29	.81	.48
3	66.0	15.3	58.3	23.0	.494	.30	.94	.47
4	65.6	14.8	58.2	22.2	.493	.31	.63	.49
5	65.5	13.6	58.7	20.4	.501	.41	.12	.51
6	66.0	9.7	61.1	14.6	.543	.90	3.61	.62
7	65.2	7.9	61.2	11.9	.544	.95	2.84	.68
8	64.5	6.8	61.1	10.2	.543	.96	.37	.72
9	63.9	6.1	60.8	9.2	.537	.91	.09	.74
10	63.0	5.6	60.2	8.4	.527	.82	1.85	.76
11	62.7	5.0	59.7	8.0	.518	.73	.73	.77

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	133.7	..	W. & N. W.	Scatd. \—i and \i till 6 A. M. cloudless till 10 A. M. Scatd. \i and \—i till 6 P. M. cloudless afterwards.
2	136.0	..	S. W.	Cloudless.
3	135.2	..	S. W. & N. & N. W. & W.	Cloudless.
4	136.0	..	N.	Cloudless.
5	140.0	..	S. & N.	Cloudless.
6	140.0	..	S. E. & S.	Cloudless till 7 A. M. Scatd. ⌒i till 5 P. M. cloudless afterwards.
7	*Sunday.*	0.12		
8	128.7		N. W.	Cloudy till 7 A. M. Scatd. \—i and \i till 4 P. M. cloudless afterwards.
9	131.0	..	N. W. & N.	Cloudless.
10	134.2	..	N. W. & N.	Cloudless.
11	133.5	0.08	N. W. & N. E.	Cloudless till 4 A. M. Scatd. \—i till 10 A. M. cloudy afterwards. Also slightly drizzling between 2 and 5 P. M.
12	..	0.34	N. & N. E. & S. E.	Cloudy also raining between Midnight and 1 A. M.
13	..	..	N. W. & N. & W.	Cloudless : also foggy between 6 and [8 A. M.
14	*Sunday.*			
15	130.0	..	N. W. & Calm.	Cloudless.
16	135.0	..	N. W. & S. W.	Cloudless.
17	137.0	..	Calm & N. & S.	Cloudless.
18	143.0	..	S. W. & S.	Cloudless till Noon, Scatd. \—i till 4 P. M. cloudless afterwards.
19	138.6	..	W. & S. W. &. S.	Cloudless.
20	138.0	..	S. W. & S.	Cloudless till 7 A. M. Scatd. \—i till 8 P. M. cloudless afterwards.
21	*Sunday.*			
22	133.0	..	W. & S. W. & N. W.	Scatd. \—i.
23	138.0	..	N. W.	Cloudless till 6 A. M. Scatd. \—i afterwards.
24	137.4	..	N. W. & W.	Scatd. \—i.
25	135.0	..	W. & S. W.	Scatd. \—i till 1 A. M. cloudless till 6 A. M. Scatd. \—i till 3 P. M. cloudy afterwards. Also very slightly drizzling between 8 and 11 P. M.
26	132.0	..	W. & N. W.	Scatd. clouds till 8 A. M. cloudless afterwards.
27	137.0	..	S. W. & S.	Cloudless till 11 A. M. Scatd. \—i till 6 P. M. cloudless afterwards.
28	*Sunday.*			

\i Cirri, \—i Cirro strati, ⌒i Cumuli, ⌒—i Cumulo strati, \⌒—i Nimbi, —i Strati, \⌒ i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1858.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.978
Max. height of the Barometer occurred at 10 A. M. on the 8th, ..	30.142
Min. height of the Barometer occurred at 4 & 5 P. M. on the 27th, ..	29.821
Extreme range of the Barometer during the month, ...	0.321
Mean of the Daily Max. Pressures, ...	30.060
Ditto ditto Min. ditto, ...	29.914
Mean Daily range of the Barometer during the month, ...	0.146

	o
Mean Dry Bulb Thermometer for the month, ...	71.0
Max. Temperature occurred at 3 P. M. on the 25th, ...	86.9
Min. Temperature occurred at 7 A. M. on the 9th, ...	55.0
Extreme range of the Temperature during the month, ...	31.9
Mean of the Daily Max. Temperature, ...	81.6
Ditto ditto Min. ditto, ...	62.0
Mean Daily range of the Temperature during the month, ..	19.6

	o
Mean Wet Bulb Thermometer for the month, ...	63.0
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	8.0
Computed Mean Dew-point for the month, ...	59.0
Mean Dry Bulb Thermometer above computed mean Dew-point, ..	12.0
	Inches.
Mean Elastic force of Vapour for the month, ...	0.506

	Troy grains.
Mean Weight of Vapour for the month, ...	5.55
Additional Weight of Vapour required for complete saturation, ..	2.70
Mean degree of humidity for the month, complete saturation being unity,	0.67

	Inches.
Rained 4 days, Max. fall of rain during 24 hours, ...	0.34
Total amount of rain during the month, ...	0.54
Prevailing direction of the Wind, ...	N. W. & S. W. & W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1858.

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	4						1	1	2		5		2		6		3		1
1	5						1	1	2		5		2		6		3		
2	5						2		1		5		2		6		3		
3	5						2		1		5		2		5		3		1
4	4						2		1		5		4		4		2		2
5	4						2		2		5		4		5		1		1
6	4				2		1		2		3		5		6		1		
7	7		2		2		1		2		2		3		5				
8	8		4		1		2		1		3		2		3				
9	6		5		1		2		1		3		2		4				
10	4		5		2		1		1		2		3		6				
11	4		2		2				1		4		3		8				
Noon.	1		2						2		4		4		11				
1	4		1						2		4		4		9				
2	1		1						2		7		4		9	1			
3	1		1				1		1		5		5		10				
4	1		1	1			1		1		2		6		12				
5	1		1	1			1		2		4		5		10				
6	2		1				1		5		4		4		7				
7	2		1				1		5		4		5		6				
8	2		1				1		5		4	1	5		6				
9	2		1				1		5		4	1	5		6				
10	2		1				1		5		4	1	4		6				1
11	2		1				1		5		4	1	5		6				

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.822	29.909	29.721	0.188	77.4	89.8	68.8	21.0
2	.807	.880	.741	.139	76.0	85.8	67.8	18.0
3	.841	.915	.775	.140	77.2	85.4	71.6	13.8
4	.871	.952	.822	.130	77.6	87.4	70.0	17.4
5	.876	.963	.812	.151	77.3	87.7	67.0	20.7
6	.858	.937	.806	.131	78.0	88.6	71.6	17.0
7	*Sunday.*							
8	.883	.965	.838	.127	80.3	89.6	73.8	15.8
9	.877	.959	.809	.150	80.0	89.3	72.3	17.0
10	.868	.941	.816	.125	80.6	88.5	75.3	13.2
11	.883	.961	.819	.142	80.9	90.7	74.4	16.3
12	.879	.975	.791	.184	80.4	91.2	71.6	19.6
13	.857	.944	.788	.156	81.9	93.7	72.6	21.1
14	*Sunday.*							
15	.857	.934	.799	.135	83.4	95.6	74.7	20.9
16	.841	.927	.764	.163	83.9	95.6	74.3	21.3
17	.823	.893	.757	.136	84.1	95.6	73.8	21.8
18	.851	.923	.792	.131	83.9	97.0	75.4	21.6
19	.908	.980	.844	.136	83.4	93.8	74.1	19.7
20	.943	30.016	.878	.138	82.7	92.6	73.5	19.1
21	*Sunday.*							
22	.836	29.911	.767	.144	83.4	94.4	74.8	19.6
23	.827	.907	.759	.148	83.6	93.4	77.4	16.0
24	.862	.945	.799	.146	84.1	94.7	74.2	20.5
25	.881	.976	.793	.183	83.4	94.2	75.6	18.6
26	.866	.953	.800	.153	83.3	92.6	76.9	15.7
27	.837	.915	.721	.194	81.9	92.0	75.0	17.0
28	*Sunday.*							
29	.772	.880	.702	.178	81.2	87.4	76.2	11.2
30	.744	.825	.686	.139	82.8	92.0	76.2	15.8
31	.758	.827	.698	.129	83.2	91.6	77.2	14.4

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the twenty-four hourly observations made, during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	71.0	6.4	67.8	9.6	0.677	7.33	2.68	0.73
2	69.2	6.8	65.8	10.2	.634	6.90	.70	.72
3	71.6	5.6	68.8	8.4	.699	7.59	.36	.76
4	68.4	9.2	63.8	13.8	.593	6.42	3.65	.64
5	67.6	9.7	62.7	14.6	.572	.20	.78	.62
6	69.8	8.2	65.7	12.3	.632	.85	.34	.67
7	*Sunday.*							
8	70.0	10.3	64.8	15.5	.613	.61	4.30	.61
9	72.0	8.0	68.0	12.0	.681	7.35	3.46	.68
10	74.2	6.4	71.0	9.6	.751	8.09	2.92	.74
11	72.0	8.9	67.5	13.4	.670	7.23	3.87	.65
12	69.8	10.6	64.5	15.9	.607	6.54	4.40	.60
13	70.7	11.2	65.1	16.8	.619	.66	.78	.58
14	*Sunday.*							
15	72.4	11.0	66.9	16.5	.657	7.03	.93	.59
16	74.8	9.1	70.2	13.7	.732	.82	.31	.65
17	74.7	9.4	70.0	14.1	.727	.78	.43	.64
18	74.0	9.9	69.0	14.9	.704	.53	.60	.62
19	72.8	10.6	67.5	15.9	.670	.18	.78	.60
20	70.8	11.9	64.8	17.9	.613	6.58	5.14	.56
21	*Sunday.*							
22	74.4	9.0	69.9	13.5	.725	7.76	4.20	.65
23	74.9	8.7	70.5	13.1	.739	.92	.11	.66
24	74.6	9.5	69.8	14.3	.722	.73	.48	.63
25	73.7	9.7	68.8	14.6	.699	.48	.48	.63
26	75.0	8.3	70.8	12.5	.746	.99	3.94	.67
27	75.5	6.4	72.3	9.6	.783	8.41	.03	.74
28	*Sunday.*							
29	75.8	5.4	73.1	8.1	.803	.65	2.56	.77
30	76.4	6.4	73.2	9.6	.806	.64	3.11	.74
31	77.0	6.2	73.9	9.3	.824	.85	.04	.74

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.857	29.969	29.729	0.240	76.6	80.0	68.0	12.0
1	.846	.955	.722	.233	76.0	79.2	68.2	11.0
2	.833	.935	.718	.217	75.5	78.6	68.5	10.1
3	.821	.927	.709	.218	75.4	78.0	69.4	8.6
4	.821	.935	.702	.233	74.5	77.9	68.2	9.7
5	.832	.942	.710	.232	74.5	77.6	68.0	9.6
6	.853	.965	.753	.212	73.9	77.8	67.0	10.8
7	.878	.989	.775	.214	74.1	78.6	67.0	11.6
8	.909	30.007	.801	.206	76.9	79.6	71.6	8.0
9	.927	.016	.824	.192	79.9	84.2	74.8	9.4
10	.928	.009	.822	.187	82.9	87.8	76.2	11.6
11	.912	.014	.807	.207	85.8	90.8	79.3	11.5
Noon.	.887	29.990	.785	.205	88.2	93.4	81.4	12.0
1	.855	.964	.751	.213	90.0	95.7	83.2	12.5
2	.822	.926	.725	.201	90.9	96.4	84.6	11.8
3	.800	.897	.698	.199	91.4	97.0	85.4	11.6
4	.787	.885	.694	.191	90.8	95.6	85.0	10.6
5	.784	.878	.686	.192	88.8	94.8	83.0	11.8
6	.795	.885	.687	.198	85.6	89.7	80.6	9.1
7	.807	.882	.695	.187	82.8	87.2	78.0	9.2
8	.833	.905	.716	.189	80.9	85.4	75.8	9.6
9	.857	.942	.740	.202	79.2	84.0	69.6	14.4
10	.866	.962	.755	.207	78.4	84.0	69.3	14.7
11	.866	.957	.757	.200	77.6	82.0	68.8	13.2

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Mid-night.	72.4	4.2	70.3	6.3	0.734	7.98	1.79	0.82
1	72.3	3 7	70.4	5.6	.736	8.00	.60	.83
2	72.0	3.5	70.2	5.3	.732	7.97	.49	.84
3	72.2	3.2	70.6	4.8	.741	8.07	.36	.86
4	71.4	3.1	69.8	4.7	.722	7.87	.31	.86
5	71.4	3.1	69.8	4.7	.722	.87	.31	.86
6	71.0	2.9	69.5	4.4	.715	.82	.19	.87
7	71.1	3.0	69.6	4.5	.717	.82	.25	.86
8	72.5	4.4	70.3	6.6	.734	.97	.89	.81
9	73.5	6.4	70.3	9.6	.734	.92	2.86	.74
10	73.8	9.1	69.2	13.7	.708	.59	4.20	.64
11	73.7	12.1	67.6	18.2	.672	.17	5.66	.56
Noon.	73.5	14.7	66.1	22.1	.640	6.79	6.97	.49
1	73.7	16.3	65.5	24.5	.628	.64	7.86	.46
2	73.5	17.4	64.8	26.1	.613	.48	8.41	.44
3	73.1	18.3	63.9	27.5	.595	.27	.83	.42
4	73.0	17.8	64.1	26.7	.599	.32	.52	.43
5	72.7	16.1	64.6	24.2	.609	.45	7.55	.46
6	73.4	12.2	67.3	18.3	.666	7.10	5.66	.56
7	73.3	9.5	68.5	14 3	.692	.44	4.31	.63
8	73.1	7.8	69.2	11.7	.708	.62	3.48	.69
9	72.8	6.4	69.6	9.6	.717	.74	2.82	.73
10	72.9	5.5	70.1	8.3	.729	.90	.41	.77
11	72.8	4.8	70.4	7.2	.736	.99	.08	.79

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	141.0	0.22	S.	Cloudless till 6 P. M. cloudy afterwards with little rain and thunder and lightning at 8 P. M. Also foggy between Midnight and 7 A. M.
2	134.5	..	S. W. & S.	Scatd. ∖–i and ∖∩i till 3 A. M. cloudless till 4 P. M. Scatd. clouds afterwards with little drizzling at 11 P. M.
3	133.0	..	S. W. & N. W.	Cloudless till 7 A. M. Scatd. ∖–i till 2 P. M. cloudless afterwards.
4	140.0	..	S. W. & W. & N. W.	Cloudless.
5	138.0	..	N. E. & S. W. & N. W.	Cloudless.
6	136.0	..	S. & N. W. & S. W.	Cloudless till 11 A. M. cloudy till 8 P. M. cloudless afterwards. Also foggy between 4 and 8 A. M.
7	*Sunday.*			
8	140.8	..	S. W. & N. & N. W.	Scatd. ∖–i till 6 A. M. cloudless afterwards.
9	141.5	..	W. & S. & S. W.	Cloudless till 3 A. M. Scatd. ∖–i and ∩i till 3 P. M cloudless afterwards.
10	138.0	..	S. W. & W.	Cloudless till 3 A. M. Scatd. clouds till 3 P. M. cloudless afterwards.
11	137.0	..	S. W. & W.	Cloudless.
12	138.0	..	S. & S. W. & W.	Cloudless till 6 A. M. Scatd. ∖–i till 6 P. M. cloudless afterwards.
13	145.0	..	S. W. & S. & W.	Cloudless till 2 A. M. Scatd. ∖–i till 9 A. M. cloudless afterwards.
14	*Sunday.*			
15	141.0	..	W. & S. & N.	Cloudless.
16	142.0	..	S. & S. W.	Cloudless.
17	143.0	..	S. & S. W.	Cloudless.
18	145.0	..	S. & S. W.	Cloudless till 5 A. M. Scatd. ∖–i till 3 P. M. cloudless afterwards.
19	136.5	..	N. W. & W.	Cloudless till 4 P. M. Scatd. ∖–i till 7 P. M. Scatd. clouds afterwards.
20	137.0	..	N. W. & S. W.	Cloudless till 7 A. M. Scatd. ∖–i afterwards.
21	*Sunday.*			
22	137.0	..	S. & S. W.	Cloudless till 8 A. M. Scatd. ∖–i and cloudless after short intervals till 9 P. M. cloudy with thunder and lightning afterwards.
23	136.5	..	S. & W.	Cloudy with thunder and lightning and drizzling at Midnight, cloudless till

∖i Cirri, ∖–i cirro strati, ∩i cumuli, ∩–i cumulo strati, ∖∩–i nimbi, —i strati, ∖∩i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
				5 A. M. cloudy till 1 P. M. cloudless afterwards.
24	138.0	..	S. W. & W.	Cloudless till 1 P. M. Scatd. ^i till 6 P. M. cloudless afterwards.
25	140.0	..	E. & S. & W.	Cloudless.
26	137.8	..	S.	Cloudless till 2 A. M. Scatd. clouds till 9 A. M. cloudless afterwards.
27	134.0	..	S.	Cloudless till 9 A. M. Scatd. \—i till 4 P. M. cloudy with thunder and lightning and raining till 8 P. M. cloudless afterwards.
28	*Sunday.*			
29	111.0	..	S.	Cloudless till 4 A. M. Scatd. clouds till 8 P. M. cloudless afterwards.
30	129.6	..	S.	Cloudless.
31	132.4	..	S. & S. W.	Cloudless till 5 A. M. cloudy till 5 P. M. cloudless afterwards.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1858.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.849
Max. height of the Barometer, occurred at 9 A. M. on the 20th, ..	30.016
Min. height of the Barometer, occurred at 5 P. M. on the 30th, ..	29.686
Extreme Range of the Barometer during the month, ...	0.330
Mean of the Daily Max. Pressures, ...	29.930
Ditto ditto Min. ditto, ...	29.781
Mean Daily range of the Barometer during the month, ...	0.149

	o
Mean Dry Bulb Thermometer for the month, ...	81.3
Max. Temperature, occurred at 3 P. M. on the 18th, ...	97.0
Min. Temperature, occurred at 6 & 7 A. M. on the 5th, ...	67.0
Extreme Range of the Temperature during the month, ...	30.0
Mean of the Daily Max. Temperature, ...	91.5
Ditto ditto Min. ditto, ...	73.6
Mean Daily range of the Temperature during the month, ...	17.9

	o
Mean Wet Bulb Thermometer for the month, ...	72.7
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	8.6
Computed Mean Dew Point for the month, ...	68.4
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	12.9
	Inches.
Mean Elastic force of vapour for the month, ...	0.690

	Troy grains.
Mean weight of vapour for the month, ...	7.42
Additional weight of vapour required for complete saturation, ..	3.82
Mean degree of Humidity for the month, complete saturation being unity,	0.66

	Inches.
Rained 4 days. Max. fall of rain during 24 hours, ...	0.22
Total amount of rain during the month, ...	0.22
Prevailing direction of the Wind, ...	S. & S. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1858.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.			1		2		1		17	1	2		3		1				
1			1		1		2		16		2		3		1				1
2			1		1		2		15		2		3		1		1		1
3			1		1				16		2		2		1		2		2
4			1		1				17		3		1		1		2		1
5					1				17		4		1		1		2		1
6					1				17		6		2		1				
7	1	1	2		1				9		9		3		2				
8	2		3		1		1		5		10		4		1				
9	3		2				2		5		10		4		1				
10	2		2		1		2		8		8		3		1				
11	2				2		2		4		9		3		5				
Noon.	3				2		2		5		8		4		3				
1					2		1		5		12		4		3				
2	1		1				1		7		9		5		3				
3							1		8		8		7		3				
4									6		8		8		5				
5									7		9		6		5				
6	1								7		11		4		4				
7	1								9	1	9		5		3				
8	1				1				11	1	7		2		4				1
9	1								13		7		2		3	1	1		
10	1								14		6		2		3		1		
11	1				1				15	1	5		2		3				

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.804	29.887	29.732	0.155	84.6	95.1	76.8	18.3
2	.775	.852	.707	.145	85.7	96.8	77.0	19.8
3	.750	.833	.649	.184	87.1	99.8	77.4	22.4
4	*Sunday.*							
5	.813	.895	.737	.158	87.0	96.4	79.8	16.6
6	.806	.912	.709	.203	86.4	97.0	77.0	20.0
7	.742	.821	.662	.159	85.9	97.4	76.6	20.8
8	.780	.870	.715	.155	86.4	97.4	77.8	19.6
9	.792	.899	.699	.200	85.8	96.4	76.8	19.6
10	.705	.801	.609	.192	86.7	97.8	77.6	20.2
11	*Sunday.*							
12	.698	.773	.621	.152	85.7	93.0	79.9	13.1
13	.725	.790	.639	.151	86.4	93.6	81.0	12.6
14	.762	.836	.710	.126	86.2	93.0	81.6	11.4
15	.787	.855	.724	.131	86.1	94.2	80.6	13.6
16	.813	.882	.758	.124	85.2	93.4	79.1	14.3
17	.805	.875	.746	.129	85.9	94.1	79.4	14.7
18	*Sunday.*							
19	.768	.854	.685	.169	88.7	101.6	78.8	22.8
20	.757	.834	.690	.144	88.0	99.0	80.0	19.0
21	.789	.859	.729	.130	87.3	97.0	81.0	16.0
22	.830	.920	.766	.154	87.0	96.4	80.8	15.6
23	.762	.860	.660	.200	88.6	99.7	79.8	19.9
24	.681	.756	.566	.190	87.4	98.0	79.8	18.2
25	*Sunday.*							
26	.735	.881	.577	.304	84.5	93.0	72.6	20.4
27	.790	.867	.700	.167	82.6	91.6	72.7	18.9
28	.809	.880	.729	.151	84.4	92.2	80.0	12.2
29	.829	.909	.760	.149	85.7	93.6	79.0	14.6
30	.776	.869	.656	.213	85.6	92.6	79.7	12.9
..	....	....	....	....	...	....	....	....

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	77.1	7.5	73.3	11.3	0.809	8.65	3.74	0.70
2	77.6	8.1	73.5	12.2	.814	.69	4.11	.68
3	76.9	10.2	71.8	15.3	.771	.20	5.13	.62
4	*Sunday.*							
5	75.2	11.8	69.3	17.7	.711	7.55	.74	.57
6	72.1	14.3	64.9	21.5	.615	6.55	6.51	.50
7	74.7	11.2	69.1	16.8	.706	7.52	5.35	.58
8	74.1	12.3	67.9	18.5	.679	.22	.84	.55
9	76.7	9.1	72.1	13.7	.778	8.29	4.54	.65
10	74.7	12.0	68.7	18.0	.697	7.41	5.77	.56
11	*Sunday.*							
12	78.9	6.8	75.5	10 2	.868	9.27	3.53	.72
13	79.4	7.0	75.9	10.5	.879	.36	.70	.72
14	79.3	6.9	75.8	10.4	.876	.35	.64	.72
15	78.9	7.2	75.3	10.8	.862	.19	.76	.71
16	79.2	6.0	76.2	9.0	.887	.49	.12	.75
17	79.5	6.4	76.3	9.6	.890	.50	.37	.74
18	*Sunday.*							
19	78.1	10.6	72.8	15.9	.795	8.43	5.53	.60
20	80.1	7.9	76.1	11.9	.885	9.40	4.28	.69
21	79.6	7.7	75.7	11.6	.873	.28	.13	.69
22	80.0	7.0	76.5	10.5	.896	.54	3.75	.72
23	80.0	8.6	75.7	12.9	.873	.26	4.66	.67
24	78.6	8.8	74.2	13.2	.832	8.85	.60	.66
25	*Sunday.*							
26	77.4	7.1	73.8	10.7	.822	.78	3.57	.71
27	76.0	6.6	72.7	9.9	.792	.51	.17	.73
28	78.8	5.6	76.0	8.4	.882	9.45	2.86	.77
29	78.8	6.9	75.3	10.4	.862	.21	3.59	.72
30	79.4	6.2	76.3	9.3	.890	.52	.24	.75
..	....	....	....	....	....	....	....	....

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.781	29.845	29.696	0.149	81.5	83.6	76.3	7.3
1	.771	.822	.675	.147	81.1	83.0	76.0	7.0
2	.755	.802	.667	.135	80.8	83.4	74.8	8.6
3	.748	.812	.666	.146	80.2	82.8	74.2	8.6
4	.758	.818	.681	.137	79.8	81.8	73.7	8.1
5	.771	.840	.688	.152	79.3	81.8	73.0	8.8
6	.793	.860	.701	.159	79.0	81.6	72.7	8.9
7	.814	.876	.726	.150	79.8	82.7	74.2	8.5
8	.837	.908	.749	.159	83.1	86.0	79.0	7.0
9	.848	.920	.752	.168	86.3	88.8	82.6	6.2
10	.848	.912	.747	.165	89.1	92.3	86.0	6.3
11	.835	.889	.727	.162	91.7	95.6	87.6	8.0
Noon.	.810	.867	.698	.169	93.4	98.3	90.0	8.3
1	.778	.838	.662	.176	94.8	100.0	89.0	11.0
2	.747	.816	.632	.184	95.2	101.3	84.6	16.7
3	.718	.782	.597	.185	95.3	101.6	87.7	13.9
4	.698	.766	.572	.194	94.5	101.1	88.7	12.4
5	.692	.766	.566	.200	92.5	100.0	87.6	12.4
6	.702	.774	.598	.176	89.6	94.3	85.8	8.5
7	.727	.808	.622	.186	87.1	91.4	84.2	7.2
8	.755	.847	.646	.201	84.7	88.3	72.6	15.7
9	.782	.881	.665	.216	83.5	86.0	74.0	12.0
10	.787	.887	.678	.209	82.6	84.8	73.4	11.4
11	.784	.874	.669	.205	82.0	83.7	73.6	10.1

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	77.1	4.4	74.9	6.6	0.851	9.15	2.16	0.81
1	76.9	4.2	74.8	6.3	.849	.15	.02	.82
2	76.7	4.1	74.6	6.2	.843	.09	1.98	.82
3	76.8	3.4	75.1	5.1	.857	.25	.63	.85
4	76.2	3.6	74.4	5.4	.838	.06	.69	.84
5	76.0	3.3	74.3	5.0	.835	.03	.56	.85
6	75.8	3.2	74.2	4.8	.832	.00	.50	.86
7	76.4	3.4	74.7	5.1	.846	.14	.61	.85
8	77.7	5.4	75.0	8.1	.854	.16	2.70	.77
9	78.4	7.9	74.4	11.9	.838	8.93	4.09	.69
10	79.2	9.9	74.2	14.9	.832	.82	5.30	.63
11	79.3	12.4	73.1	18.6	.803	.46	6.77	.56
Noon.	79.7	13.7	72.8	20.6	.795	.34	7.65	.52
1	79.6	15.2	72.0	22.8	.776	.11	8.54	.49
2	79.5	15.7	71.6	23.6	.766	.00	.84	.48
3	79.2	16.1	71.1	24.2	.753	7.88	9.01	.47
4	78.6	15.9	70.6	23.9	.741	.76	8.75	.47
5	78.3	14.2	71.2	21.3	.756	.95	7.64	.51
6	77.9	11.7	72.0	17.6	.776	8.19	6.14	.57
7	77.9	9.2	73.3	13.8	.809	.59	4.74	.64
8	77.2	7.5	73.4	11.3	.811	.67	3.75	.70
9	77.2	6.3	74.0	9.5	.827	.86	.14	.74
10	77.3	5.3	74.6	8.0	.843	9.05	2.63	.78
11	77.1	4.9	74.6	7.4	.843	.07	.40	.79

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	134.2	..	S.	Cloudless.
2	135.0	..	S.	Cloudless.
3	147.0	..	S.	Cloudless.
4	*Sunday.*			
5	139.0	..	S. & N. W. & E.	Cloudy till 7 A. M. cloudless till 3 P. M. Scatd. ╲—i & ⌒i afterwards.
6	137.0	..	S. & S. W.	Scatd. ╲—i till noon cloudless afterwards.
7	134.0	..	S. & W.	Cloudless.
8	141.2	..	S. & N. W.	Cloudless.
9	148.0	..	S.	Cloudless.
10	135.2	..	S.	Cloudless.
11	*Sunday.*			
12	132.0	..	S. & S. E. (high.)	Scatd. clouds till 4 A. M. cloudless till 5 P. M. Scatd. ╲—i afterwards.
13	135.0	..	S. (high.)	Cloudless till 4 A. M. Scatd. clouds afterwards.
14	..	..	S. & S. E.	Cloudless till 8 A. M. cloudy afterwards.
15	128.0	..	S.	Cloudy till 4 A. M. Scatd. ╲—i & ⌒i till 4 P. M. cloudy afterwards.
16	130.0	..	S. & S. E.	Various clouds till 8 P. M. cloudless afterwards.
17	130.5	..	S.	Cloudless till 4 P. M. cloudy till 9 P. M. cloudless afterwards.
18	*Sunday.*			
19	148.6	..	Calm & S.	Cloudless.
20	138.0	..	S.	Cloudless.
21	130.0	..	S.	Scatd. ╲i & ╲—i till 3 P. M. cloudy afterwards.
22	132.5	..	S.	Scatd. clouds.
23	150.0	..	S.	Cloudless.
24	143.0	..	S. & S. W.	Cloudless.
25	*Sunday.*			
26	125.0	0.60	S.	Scatd. ╲—i till 6 P. M. cloudy afterwards, also raining, thundering and lightning between 8 and 10 P. M.
27	128.0	..	N. E. & S. & S. E.	Scatd. clouds.
28	125.0	0.37	S. & S. E.	Various clouds also raining between 1 and 2 P. M.
29	130 0	..	S.	Scatd. ╲i & ╲—i till 1 P. M. cloudless afterwards.
30	130.0	..	S. (high.)	Scatd. ╲—i.

╲i Cirri, ╲—i Cirro strati, ⌒i Cumuli, ⌒—i Cumulo strati, ∿—i Nimbi, —i Strati, ∿ i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1858.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.772
Max. height of the Barometer occurred at 9 A. M. on the 22nd, ..	29.920
Min. height of the Barometer occurred at 5 P. M. on the 24th, ..	29.566
Extreme range of the Barometer during the month, ...	0.354
Mean of the Daily Max. Pressures, ...	29.857
Ditto ditto Min. ditto, ...	29.690
Mean Daily range of the Barometer during the month, ...	0.167

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	o
Mean Dry Bulb Thermometer for the month, ...	86.2
Max. Temperature occurred at 3 P. M. on the 19th, ...	101.6
Min. Temperature occurred at 8 P. M. on the 26th, ...	72.6
Extreme range of the Temperature during the month, ...	29.0
Mean of the Daily Max. Temperature, ...	95.8
Ditto ditto Min. ditto, ...	78.6
Mean Daily range of the Temperature during the month, ..	17.2

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	o
Mean Wet Bulb Thermometer for the month, ...	77.8
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	8.4
Computed Mean Dew-point for the month, ...	73.6
Mean Dry Bulb Thermometer above computed mean Dew-point, ..	12.6
	Inches.
Mean Elastic force of Vapour for the month, ...	0.817

	Troy grains.
Mean Weight of Vapour for the month, ...	8.70
Additional Weight of Vapour required for complete saturation, ..	4.29
Mean degree of humidity for the month, complete saturation being unity,	0.67

	Inches.
Rained 4 days, Max. fall of rain during 24 hours, ...	0.60
Total amount of rain during the month, ...	0.97
Prevailing direction of the Wind, ...	S.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1858.

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.			1				2		21		1						1		
1			1				2		21	1	1						1		
2			1		1	1	2		19								1		2
3			1		1		2		20								1		1
4			1		1		2		18	1							1		3
5			1				2		20		1		1				1		
6			1				3		18		1		2				1		
7			1				4		17		1		2		1				
8	1		1				3		18		2				1				
9			1		1		2		18		3				1				
10			1				2		19		3				1				
11	1		1		1		1		16		4				2				
Noon.	2		1		1		1		16		4				1				
1	2				2		1		15		5	1	1						
2			1		1		3	1	16		3		2						
3	1		1		1		2		16		3		1		1				
4	3								18		3		1		1				
5	1		1						18		1		2		2		1		
6			1				3		17		2		1		1		1		
7							2		21		1		1		1				
8							3	1	20	1			1		1				1
9					1	1	3		20						1				1
10					1		3		20				1		1				
11					2		2		20				1		1				

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.707	29.781	29.606	0.175	86.9	94.3	81.3	13.0
2	*Sunday.*							
3	.713	.810	.620	.190	83.6	92.2	75.8	16.4
4	.684	.753	.613	.140	86.0	94.2	79.0	15.2
5	.646	.707	.552	.155	86.7	92.6	81.6	11.0
6	.660	.738	.583	.155	87.4	94.3	82.2	12.1
7	.644	.702	.578	.124	86.5	94.0	79.6	14.4
8	.652	.730	.568	.162	87.3	94.4	81.6	12.8
9	*Sunday.*							
10	.727	.815	.657	.158	84.6	91.4	80.7	10.7
11	.670	.737	.596	.141	86.0	92.6	80.4	12.2
12	.642	.717	.564	.153	87.3	95.0	81.2	13.8
13	.619	.679	.533	.146	87.3	95.0	81.0	14.0
14	.622	.683	.559	.124	88.1	96.0	82.1	13.9
15	.623	.672	.561	.111	86.3	95.8	79.8	16.0
16	*Sunday.*							
17	.565	.635	.484	.151	82.9	91.6	78.6	13.0
18	.510	.577	.435	.142	82.0	87.6	79.4	8.2
19	.385	.455	.312	.143	84.2	90.8	79.8	11.0
20	.276	.347	.201	.146	80.7	86.2	78.2	8.0
21	.382	.426	.321	.105	86.1	94.0	78.0	16.0
22	.440	.498	.358	.140	87.7	95.2	83.4	11.8
23	*Sunday.*							
24	.511	.587	.459	.128	87.4	94.8	79.0	15.8
25	.549	.607	.498	.109	83.9	89.8	78.0	11.8
26	.608	.691	.552	.139	85.0	90.4	81.8	8.6
27	.601	.675	.511	.164	86.6	95.2	79.4	15.8
28	.574	.640	.514	.126	88.0	96.6	82.3	14.3
29	.600	.653	.536	.117	89.8	99.6	83.8	15.8
30	*Sunday.*							
31	.626	.674	.570	.104	88.2	100.6	82.2	18.4

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	79.9	7.0	76.4	10.5	0.893	9.51	3.74	0.72
2	*Sunday.*							
3	77.4	6.2	74.3	9.3	.835	8.96	.07	.75
4	78.9	7.1	75.3	10.7	.862	9.19	.72	.71
5	80.6	6.1	77.5	9.2	.925	.86	.32	.75
6	80.6	6.8	77.2	10.2	.916	.75	.70	.73
7	78.3	8.2	74.2	12.3	.832	8.87	4.23	.68
8	80.8	6.5	77.5	9.8	.925	9.84	3.57	.73
9	*Sunday.*							
10	79.2	5.4	76.5	8.1	.896	.59	2.80	.77
11	79.5	6.5	76.2	9.8	.887	.47	3.44	.73
12	80.3	7.0	76.8	10.5	.905	.61	.80	.72
13	80.1	7.2	76.5	10.8	.896	.54	.87	.71
14	80.6	7.5	76.8	11.3	.905	.61	4.11	.70
15	80.0	6.3	76.8	9.5	.905	.63	3.39	.74
16	*Sunday.*							
17	79.4	3.5	77.6	5.3	.928	.97	1.82	.85
18	79.0	3.0	77.5	4.5	.925	.94	.53	.87
19	79.3	4.9	76.8	7.4	.905	.69	2.55	.79
20	77 5	3.2	75.9	4.8	.879	.47	1.57	.86
21	81.3	4.8	78 9	7.2	.967	10.32	2.63	.80
22	83.3	4.4	81.1	6.6	1.037	11.01	.55	.81
23	*Sunday*							
24	82.6	4.8	80.2	7.2	.008	10.73	.72	.80
25	78.7	5.2	76.1	7.8	0.885	9.48	.65	.78
26	80.3	4.7	77.9	7.1	.937	10.02	.51	.80
27	79.2	7.4	75.5	11.1	.868	9.25	3.89	.70
28	80.2	7.8	76.3	11.7	.890	.46	4.22	.69
29	80.9	8 9	76.4	13.4	.893	.47	.95	.66
30	*Sunday.*							
31	81.5	6.7	78.1	10.1	.943	10.02	3.74	.73

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.601	29.747	29.306	0.441	82.9	86.2	75.8	10.4
1	.588	.736	.283	.453	82.6	86.0	76.6	9.4
2	.572	.718	.272	.446	82.4	85.8	78.8	7.0
3	.570	.712	.262	.450	81.8	85.4	76.4	9.0
4	.583	.725	.255	.470	81.5	84.6	76.4	8.2
5	.581	.729	.266	.463	81.1	84.8	76.8	8.0
6	.603	.755	.284	.471	81.1	85.0	76.6	8.4
7	.618	.770	.296	.474	82.2	86.2	78.0	8.2
8	.635	.798	.302	.496	84.5	89.0	78.6	10.4
9	.646	.815	.298	.517	86-6	90.8	79.6	11.2
10	.640	.808	.297	.511	88.6	93.4	80.2	13.2
11	.625	.787	.288	.499	90.1	96.8	80.1	16.7
Noon.	.606	.763	.272	.491	91.1	98.9	79.4	19.5
1	.586	.735	.248	.487	91.7	100.6	80.6	20.0
2	.561	.697	.212	.485	92.4	100.3	79.0	21.3
3	.539	.680	.201	.479	91.9	99.6	78.6	21.0
4	.521	.657	.208	.449	91.2	99.3	78.7	20.6
5	.522	.657	.231	.426	89.7	97.8	79.5	18.3
6	.532	.690	.254	.436	87.9	96.0	79.3	16.7
7	.553	.710	.278	.432	86.0	89.8	79.7	10.1
8	.571	.731	.279	.452	84.9	88.0	79.6	8.4
9	.595	.748	.338	.410	84.1	86.8	79.0	7.8
10	.608	.736	.345	.391	83.6	85.8	78.2	7.6
11	.606	.763	.331	.432	83.2	85.6	79.2	6.4

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	79.3	3.6	77.5	5.4	0.925	9.94	1.85	0.84
1	79.2	3.4	77.5	5.1	.925	.94	.74	.85
2	79.0	3.4	77.3	5.1	.919	.88	.73	.85
3	78.6	3.2	77.0	4.8	.910	.79	.61	.86
4	78.2	3.3	76.5	5.0	.896	.65	.66	.85
5	78.0	3.1	76.4	4.7	.893	.62	.55	.86
6	78.2	2.9	76.7	4.4	.902	.72	.45	.87
7	79.0	3.2	77.4	4.8	.922	.91	.63	.86
8	79.8	4.7	77.4	7.1	.922	.87	2.48	.80
9	80.6	6.0	77.6	9.0	.928	.89	3.25	.75
10	81.0	7.6	77.2	11.4	.916	.73	4.19	.70
11	81.4	8.7	77.0	13.1	.910	.63	.91	.66
Noon.	81.6	9.5	76.8	14.3	.905	.55	5.42	.64
1	81.6	10.1	76.5	15.2	.896	.46	.77	.62
2	81.7	10.7	76.3	16.1	.890	.38	6.16	.60
3	81.6	10.3	76.4	15.5	.893	.41	5.91	.61
4	81.2	10.0	76.2	15.0	.887	.37	.65	.62
5	80.5	9.2	75.9	13.8	.879	.30	.07	.65
6	80.1	7.8	76.2	11.7	.887	.43	4.21	.69
7	79.9	6.1	76.8	9.2	.905	.65	3.26	.75
8	79.5	5.4	76.8	8.1	.905	.67	2.82	.77
9	79.6	4.5	77.3	6.8	.919	.84	.37	.81
10	79.6	4.0	77.6	6.0	.928	.95	.08	.83
11	79.3	3.9	77.3	5.9	.919	.86	.03	.83

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	131.2	..	S.	Scatd. \—i till 4 P. M. cloudy afterwards.
2	*Sunday.*	1.84		
3	137.6	..	S.	Cloudy till 5 A. M. cloudless till 10 A. M. Scatd. ⌒i till 6 P. M. cloudy afterwards.
4	134.0	..	S. & S. E.	Cloudy till 7 A. M. Scatd. \—i till 4 P. M. cloudy afterwards, also drizzling at 8 P. M.
5	134.0	..	S.	Cloudless till 5 A. M. Scatd. \—i afterwards, also thunder and lightning and drizzling at 7 P. M.
6	127.0	..	S. E. & S.	Scatd. clouds.
7	130.4	..	S. & S. E.	Scatd. clouds till 5 P. M. cloudless afterwards.
8	129.0	..	S.	Cloudless till 3 A. M. Scatd. \—i and ⌒i till 5 P. M. cloudless afterwards.
9	*Sunday.*			
10	129.4	0.13	S. & S. E.	Scatd. clouds nearly the whole day, also raining between Noon and 1 P. M.
11	124.0	..	S.	Scatd. clouds till 7 P. M. cloudless afterwards.
12	134.0	..	S. & S. E.	Cloudless till 6 A. M. Scatd. ⌒i afterwards.
13	129.0	..	S.	Cloudless till 7 A. M. Scatd. \—i and ⌒i till 5 P. M. cloudless afterwards.
14	136.0	..	S.	Scatd. clouds till 6 P. M. cloudless afterwards.
15	131.0	..	S. & N.	Cloudless till 7 A. M. Scatd. \—i and ⌒i till 3 P. M. cloudy afterwards, also drizzling at 6 P. M.
16	*Sunday.*			
17	..	0.79	S. & S. E.	Cloudy, also drizzling between Noon to 5 P. M.
18	..	0.14	E.	Cloudy nearly the whole day, and also raining between 11 A. M. to 1 P. M.
19	..	..	N. & N. E.	Scatd. \—i till 5 A. M. cloudy afterwards.
20	..	0.23	N. & N. W.	Cloudy and drizzling nearly the whole day.
21	126.4	..	S. & S. W. & N. E.	Cloudy till 2 A. M. Scatd. \—i afterwards.

\i Cirri, \—i Cirro strati, ⌒i Cumuli, ⌒—i Cumulo strati, \⌒—i Nimbi, —i Strati, \⌒ i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the Month of May, 1858.

Solar Radiation, Weather, &c.

Date.	Max Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
22	130.5	..	S.	Cloudy the whole day.
23	*Sunday.*			
24	..	..	S. & S. E.	Cloudy, also very slightly drizzling at 6 A. M.
25	..	0.15	S.	Cloudy, also drizzling from 2 to 7 A. M.
26	..	..	S. E. & S.	Cloudy nearly the whole day.
27	134.8	..	S. W. & S.	Scatd. \—i and ⌒i till 6 P. M. cloudless afterwards.
28	125.9	..	S. & W. & S. W.	Scatd. \i and \—i till 7 P. M. cloudless afterwards.
29	143.6	..	S. & W. & S. E.	Cloudy till 7 A. M. Scatd. ⌒i afterwards.
30	*Sunday.*			
31	127.9	..	S. E.	Scatd. \—i till 7 A. M. cloudy afterwards, also very slightly drizzling at 2 P. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May, 1858.

MONTHLY RESULTS.

	Inches.
Mean height of the Barometer for the month, ...	29.586
Max. height of the Barometer occurred at 9 A. M. on the 10th, ..	29.815
Min. height of the Barometer occurred at 3 P. M. on the 20th, ..	29.201
Extreme range of the Barometer during the month, ...	0.614
Mean of the Daily Max. Pressures, ...	29.653
Ditto ditto Min. ditto, ...	29.513
Mean daily range of the Barometer during the month, ...	0.140

	o
Mean Dry Bulb Thermometer for the month, ...	86.0
Max. Temperature occurred at 1 P. M. on the 31st, ...	100.6
Min. Temperature occurred at Midnight on the 3rd, ...	75.8
Extreme range of the Temperature during the month, ...	24.8
Mean of the daily Max. Temperature, ...	93.6
Ditto ditto Min. ditto, ...	80.4
Mean daily range of the Temperature during the month, ..	13.2

	o
Mean Wet Bulb Thermometer for the month, ...	80.0
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	6.0
Computed Mean Dew-point for the month, ...	77.0
Mean Dry Bulb Thermometer above computed mean Dew-point, ..	9.0
	Inches.
Mean Elastic force of Vapour for the month, ...	0.910

	Troy grains.
Mean Weight of Vapour for the month, ...	9.71
Additional Weight of Vapour required for complete saturation, ..	3.20
Mean degree of humidity for the month, complete saturation being unity,	0.75

	Inches.
Rained 10 days, Max. fall of rain during 24 hours, ...	1.84
Total amount of rain during the month, ...	3.28
Prevailing direction of the Wind, ...	S. & S. E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May, 1858.

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	2		1		1		5		14						1		2		
1	2		1				4		15								4		
2	2		2				6		14	1							1		1
3	2		2				7		14	1							1		
4	2	1					6		15	1									3
5	3	1	1		1		4		14	1									3
6	4	1			1		4		17	2									
7	4	1	1		1		6		13	1	1								
8	3	1	3		1		2		14		3								
9	2	1	2		3		2		13		4								
10	2		1		1		1		15		4				2	1			
11	3	1	1		1	1	2		16		2		1						
Noon.	3		2	1	1	1	1		14		4		1						
1	2		1	1			4		11	1	5		3	1					
2	2		1	1			3		13		3	1	3		1				
3	1				1		6		11		3		3		1	1			
4	1				1		5	1	13		3		2		1	1			
5	1		1		2		3		14	1	2		2		1				
6	1	1	1		1		6		12		3		1		1				
7	1		1		2		6		13	1	1		1		1	1			
8	1		1		1		7	1	14		1		1						
9	1		1		2		6		14		2								
10			1		2		7		14		2								
11			1		1		7		15		2								

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.602	29.654	29.537	0.117	87.4	101.2	81.6	19.6
2	.547	.601	.476	.125	89.8	99.8	82.6	17.2
3	.518	.573	.454	.119	90.8	102.0	84.4	17.6
4	.509	.578	.444	.134	93.6	105.5	84.8	20.7
5	.502	.575	.435	.140	93.9	105.8	85.2	20.6
6	*Sunday.*							
7	.465	.512	.382	.130	92.4	101.5	85.7	15.8
8	.505	.547	.444	.103	92.2	100.8	85.9	14.9
9	.534	.592	.481	.111	91.1	101.0	85.8	15.2
10	.528	.574	.446	.128	90.3	96.9	85.6	11.3
11	.505	.548	.441	.107	88.1	97.0	81.6	15.4
12	.492	.544	.406	.138	89.9	98.0	84.8	13.2
13	*Sunday.*							
14	.541	.618	.488	.130	89.6	96.5	84.2	12.3
15	.595	.647	.531	.116	86.6	90.6	83.2	7.4
16	.590	.633	.541	.092	85.1	96.0	80.0	16.0
17	.547	.600	.477	.123	86.4	94.3	79.9	14.4
18	.527	.586	.462	.124	83.8	93.9	79.3	14.6
19	.515	.576	.442	.134	83.4	90.4	78.5	11.9
20	*Sunday.*							
21	.450	.514	.375	.139	82.0	85.8	79.4	6.4
22	.449	.512	.403	.109	82.1	86.6	79.0	7.6
23	.527	.597	.484	.113	82.0	85.7	79.0	6.7
24	.587	.638	.539	.099	82.3	86.8	77.8	9.0
25	.592	.639	.537	.102	85.3	92.0	81.0	11.0
26	.586	.639	.517	.122	84.4	91.6	80.2	11.4
27	*Sunday.*							
28	.511	.544	.467	.077	82.6	87.2	80.3	6.9
29	.524	.558	.486	.072	80.6	89.6	76.7	12.9
30	.545	.583	.502	.081	83.5	89.6	78.6	11.0

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	80.6	6.8	77.2	10.2	0.916	9.75	3.70	0.73
2	83.8	6.0	80.8	9.0	1.027	10.87	.55	.75
3	83.4	7.4	79.7	11.1	0.992	.48	4.36	.71
4	80.9	12.7	74.5	19.1	.840	8.83	7.25	.55
5	83.1	10.8	77.7	16.2	.931	9.78	6.44	.60
6	*Sunday.*							
7	83.7	8.7	79.3	13.1	.979	10.31	5.23	.66
8	84·3	7.9	80.3	11.9	1.011	.65	4.80	.69
9	83.8	7.3	80.1	11.0	.005	.60	.37	.71
10	83.6	6.7	80.2	10.1	.008	.66	3 97	.73
11	82.3	5.8	79.4	8.7	0.983	.43	.29	.76
12	84.0	5.9	81.0	8.9	1.034	.94	.52	.76
13	*Sunday.*							
14	82.1	7.5	78.3	11.3	0.949	.05	4.28	.70
15	80.7	5.9	77.7	8.9	.931	9.92	3.22	.76
16	79.9	5.2	77.3	7.8	.919	.82	2.75	.78
17	81.3	5.1	78.7	7.7	.961	10.24	.82	.78
18	80.3	3.5	78.5	5.3	.955	.25	1.85	.85
19	79.1	4.3	76.9	6.5	.908	9.72	2.24	.81
20	*Sunday.*							
21	79.1	2.9	77.6	4.4	.928	.99	1.48	.87
22	78.8	3 3	77.1	5.0	.913	.82	.69	.85
23	78.7	3.3	77.0	5.0	.910	.79	.68	.85
24	79.0	3.3	77.3	5.0	.919	.88	.70	.85
25	80.1	5.2	77.5	7.8	.925	.88	2.76	.78
26	80.5	3.9	78.5	5.9	.955	10.23	.08	.83
27	*Sunday.*							
28	79.5	3.1	77.9	4.7	.937	.06	1.62	.86
29	78.2	2.4	77.0	3.6	.910	9.81	.20	.89
30	79.5	4.0	77.5	6.0	.925	.92	2.08	.83

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.547	29.633	29.464	0.169	83.4	87.7	78.8	8.9
1	.533	.619	.451	.168	83.2	87.2	78.6	8.6
2	.525	.616	.433	.183	83.1	87.2	77.0	10.2
3	.517	.606	.415	.191	82.8	86.7	76.8	9.9
4	.513	.597	.403	.194	82.8	86.4	76.7	9.7
5	.527	.609	.405	.204	82.5	85.9	77.8	8.1
6	.538	.619	.424	.195	82.5	86.4	78.0	8.4
7	.555	.629	.445	.184	83.5	87.5	78.6	8.9
8	.567	.639	.463	.176	85.5	90.4	79.5	10.9
9	.574	.654	.465	.189	87.8	94.0	80.4	13.6
10	.573	.647	.466	.181	89.9	97.2	81.4	15.8
11	.564	.645	.464	.181	91.8	99.6	83.0	16.6
Noon.	.549	.643	.452	.191	92.4	101.8	81.0	20.8
1	.527	.602	.438	.164	92.9	104.4	80.0	24.4
2	.504	.574	.405	.169	93.3	105.6	79.4	26.2
3	.486	.567	.384	.183	92.9	105.8	80.8	25.0
4	.475	.549	.376	.173	91.3	105.3	80.4	24.9
5	.477	.579	.375	.204	89.8	103.6	78.4	25.2
6	.488	.573	.384	.189	87.9	100.1	78.3	21.8
7	.506	.584	.407	.177	86.4	95.6	78.8	16.8
8	.528	.602	.434	.168	85.5	92.9	79.3	13.6
9	.545	.609	.453	.156	84.8	90.9	80.2	10.7
10	.552	.618	.480	.138	84.6	90.0	79.7	10.3
11	.554	.631	.481	.150	84.0	88.6	79.3	9.3

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Mid-night.	80.2	3.2	78.6	4.8	0.958	10.28	1.68	0.86
1	80.2	3.0	78.7	4.5	.961	.31	.58	.87
2	80.2	2.9	78.7	4.4	.961	.33	.53	.87
3	79.9	2.9	78.4	4.4	.952	.23	.52	.87
4	79.9	2.9	78.4	4.4	.952	.23	.52	.87
5	79.7	2.8	78.3	4.2	.949	.20	.44	.88
6	79.8	2.7	78.4	4.1	.952	.23	.41	.88
7	80.4	3.1	78.8	4.7	.964	.34	.66	.86
8	81.3	4.2	79.2	6.3	.976	.43	2.29	.81
9	82.0	5.8	79.1	8.7	.973	.34	3.26	.76
10	82.5	7.4	78.8	11.1	.964	.21	4.25	.71
11	83.1	8.7	78.7	13.1	.961	.14	5.13	.66
Noon.	82.9	9.5	78.1	14 3	.943	9.93	.61	.64
1	82.8	10.1	77.7	15.2	.931	.80	.97	.62
2	82.6	10.7	77.2	16.1	.916	.63	6.32	.60
3	82.6	10.3	77.4	15.5	.922	.69	.08	.61
4	81.7	9.6	76.9	14.4	.908	.58	4.58	.64
5	81.3	8.5	77.0	12.8	.910	.63	.79	.67
6	81.0	6.9	77.5	10.4	.925	.84	3.80	.72
7	80.8	5.6	78.0	8.4	.940	10.03	.03	.77
8	80.7	4.8	78.3	7.2	.949	.14	2.58	.80
9	80.7	4.1	78.6	6.2	.958	.26	.20	.82
10	80.9	3.7	79.0	5.6	.970	.37	.02	.84
11	80.6	3.4	78.9	5.1	.967	.37	1.80	.85

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	140.0	0.26	S. & S. E. & E.	Cloudless till 3 A. M. Scatd. ╲—i till 3 P. M. cloudy afterwards, also raining at 4 and 6 P. M.
2	140.0	..	S. & S. E.	Scatd. ╲i and ╲—i.
3	140.0	..	S.	Cloudless till 10 A. M. Scatd. clouds till 6 P. M. cloudless afterwards.
4	149.0	..	S. E. & S. W.	Cloudy till 6 A. M. cloudless afterwards.
5	144.0	..	S.	Cloudless till 1 P. M. Scatd. ╲—i till 7 P. M. cloudless afterwards.
6	*Sunday.*			
7	144.7	..	S. &. N. E.	Cloudless till 8 A. M. Scatd ╲i and ╲—i till 3 P. M., cloudy till 8 P. M. cloudless afterwards.
8	142.5	..	S.	Cloudless.
9	142.0	..	S. & S. E.	Cloudless till 5 A. M cloudy till 11 A. M. cloudless till 5 P. M. Scatd. ╲—i afterwards.
10	124.2	..	S.	Scatd ╲i till 5 A. M. Scatd. clouds afterwards.
11	125.0	0.32	S. & S. E.	Cloudless till 3 A. M. cloudy afterwards also drizzling between 5 and 6 P. M.
12	135.0	..	S & S. E.	Cloudy the whole day.
13	*Sunday.*			
14	142.0	..	S. E. & S. & E.	Cloudy till 5 A. M. Scatd. ╲—i till 11 A. M. cloudy afterwards.
15	..	..	S. & S. E.	Cloudy the whole day and also slightly drizzling at 4, 6, and 9 A. M.
16	126.0	0.18	S. & S. W.	Scatd. ╲—i till 11 A. M. cloudy afterwards also raining at Noon and 6 P. M.
17	..	..	S.	Cloudy till 10 A. M. Scatd. ╲—i and ⌒i till 3 P. M. cloudy afterwards.
18	..	1.89	S. & S. E.	Cloudless till 3 A. M. cloudy afterwards also raining between 1 to 6 P. M.
19	..	..	S. & N.	Cloudy also slightly raining between 7 and 8 P. M.
20	*Sunday.*	1.18		
21	..	0.24	N. E. & N. & E.	Cloudy nearly the whole day and also drizzling between 8 A. M. to 1 P. M.
22	..	..	N. E. & S. E. &. E.	Cloudy nearly the whole day, also slighty drizzling between 11 A. M. to 1 P. M.
23	..	0.46	S. E. & E.	Cloudy till 6 P. M. Scatd. ╲i and ╲—i afterwards, and also raining at Noon.
24	..	0.12	S. & S. E.	Cloudy, and also raining at 2 and 9 A. M.

╲i Cirri, ╲—i cirro strati, ⌒i cumuli, ⌒—i cumulo strati, ╲⌒—i nimbi, —i strati, ╲⌒i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
25	120.0	..	S.	Scatd. clouds.
26	...	0.82	S.	Cloudy, and also raining at 4 and 5 A. M. and between 3 and 6 P. M.
27	*Sunday.*	1.24		
28	..	0.24	S. W. & S.	Cloudy, and also drizzling occasionally between Noon and 9 P. M.
29	..	1.19	S. & S. W.	Cloudy also raining nearly the whole day.
30	..	0.08	S. & S. W.	Scatd. clouds, also raining at 4 A. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1858.

Monthly Results.

		Inches.
Mean height of the Barometer for the month,	.. ..	29.530
Max. height of the Barometer, occurred at 9 A. M. on the 1st,	..	29.654
Min. height of the Barometer, occurred at 5 P. M. on the 21st,	..	29.375
Extreme Range of the Barometer during the month,	.. ..	0.279
Mean of the Daily Max. Pressures,	.. .. ..	29.584
Ditto ditto Min. ditto,	.. ..	29.469
Mean Daily range of the Barometer during the month,	.. ..	0.115

		o
Mean Dry Bulb Thermometer for the month,	.. ..	86.9
Max. Temperature, occurred at 3 P. M. on the 5th,	.. ..	105.8
Min. Temperature, occurred at 4 A. M. on the 29th,	.. ..	76.7
Extreme Range of the Temperature during the month,	.. ..	29.1
Mean of the Daily Max. Temperatures,	.. .. ..	94.9
Ditto ditto Min. ditto,	.. .. ..	81.7
Mean Daily range of the Temperatures during the month,..	..	13.2

		o
Mean Wet Bulb Thermometer for the month,	.. ..	81.2
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,	..	5.7
Computed Mean Dew Point for the month,	.. ..	78.3
Mean Dry Bulb Thermometer above computed Mean Dew Point,	..	8.6
		Inches.
Mean Elastic force of vapour for the month, ..	.. ..	0.949

		Troy grains.
Mean weight of vapour for the month,	.. .. ..	10.09
Additional weight of vapour required for complete saturation,	..	3.16
Mean degree of Humidity for the month, complete saturation being unity,		0.76

		Inches.
Rained 16 days. Max. fall of rain during 24 hours,	.. ..	1.89
Total amount of rain during the month,	.. .. ..	8.22
Prevailing direction of the Wind, ..	.. ..	S. & S. E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1858.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	1		1		2		8		13										1
1	1	1	1		2		5		15								1		1
2	1	1	1		2		6	1	14	1							2		
3			1		2		6		14	1							1		2
4	1		1		2		5		14	4									3
5	1		1		1		8		13	1							1		1
6	1		3		1		5		14	2	2								
7	1		2	1	2		5		12		3				1				
8	1		1	1	4				18	1	2								
9	1		1	1	3		2	1	17	1	2								
10	1		2	1	1		1		17		4								
11			3	1	2	1	1		17		3								
Noon.			2	1	1		3	2	16	1	4	1							
1			2	1	2	1	2	1	15		5								
2			2		2	1	6		13	1	2				1				
3			1		2		4		15	2	2		1		1				
4			1				5	1	14	1	4	2	2	1					
5			2	1			6	1	14		3	1	1						
6			1		3	1	6	2	12	1	3	3	1						
7	1		1		3		6		12		3	2							
8	1		1		1		5		13	1	3	1					2		
9	1		1		1		4	1	15		3	1					1		
10	1		1		2		3		16		2	1							1
11	1		1		2		3		16		3								

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.573	29.623	29.519	0.104	85.1	90.3	78.4	11.9
2	.586	.624	.528	.096	85.3	93.1	78.2	14.9
3	.585	.646	.534	.112	85.8	91.8	81.8	10.0
4	*Sunday.*							
5	.546	.592	.488	.104	84.3	91.4	81.2	10.2
6	.546	.618	.467	.151	85.2	93.7	81.0	12.7
7	.581	.624	.532	.092	84.7	92.0	80.4	11.6
8	.611	.655	.569	.086	84.2	88.6	81.6	7.0
9	.649	.693	.600	.093	84.3	89.6	81.2	8.4
10	.628	.677	.538	.139	85.3	91.8	80.9	10.9
11	*Sunday.*							
12	.519	.571	.433	.138	84.0	90.0	80.6	9.4
13	.496	.540	.435	.105	83.4	88.2	80.2	8.0
14	.526	.558	.478	.080	81.4	84.8	79.2	5.6
15	.524	.569	.462	.107	83.3	88.0	79.2	8.8
16	.596	.657	.545	.112	81.3	85.9	79.2	6.7
17	.641	.690	.579	.111	83.6	88.8	79.0	9.8
18	*Sunday.*							
19	.513	.591	.422	.169	84.6	91.2	79.8	11.4
20	.526	.599	.470	.129	83.7	89.8	80.8	9.0
21	.575	.618	.534	.084	83.9	90.8	81.0	9.8
22	.563	.608	.508	.100	82.1	87.8	79.8	8.0
23	.507	.585	.416	.169	79.9	81.8	78.0	3.8
24	.356	.454	.263	.191	81.2	83.4	80.0	3.4
25	*Sunday.*							
26	.485	.570	.430	.140	82.5	85.4	80.0	5.4
27	.591	.635	.547	.088	84.0	87.6	81.9	5.7
28	.627	.668	.578	.090	84.7	90.5	80.6	9.9
29	.634	.673	.567	.106	85.7	91.2	81.4	9.8
30	.633	.687	.577	.110	86.0	92.0	80.2	11.8
31	.674	.724	.617	.107	82.6	85.5	81.4	4.1

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	80.9	4.2	78.8	6.3	0.964	10.31	2.26	0.82
2	81.2	4.1	79.1	6.2	.973	.40	.24	.82
3	81.5	4.3	79.3	6.5	.979	.44	.39	.81
4	*Sunday.*							
5	80.9	3.4	79.2	5.1	.976	.45	1.83	.85
6	81.2	4.0	79.2	6.0	.976	.43	2.18	.83
7	81.0	3.7	79.1	5.6	.973	.40	.02	.84
8	81.0	3.2	79.4	4.8	.983	.51	1.73	.86
9	80.5	3.8	78.6	5.7	.958	.26	2.02	.84
10	81.0	4.3	78.8	6.5	.964	.29	.35	.81
11	*Sunday.*							
12	80.5	3.5	78.7	5.3	.961	.31	1.86	.85
13	79.8	3.6	78.0	5.4	.940	.09	.87	.84
14	79.0	2.4	77.8	3.6	.934	.05	.22	.89
15	79.4	3.9	77.4	5.9	.922	9.89	2.04	.83
16	79.0	2.3	77.8	3.5	.934	10.05	1.19	.89
17	80.2	3.4	78.5	5.1	.955	.25	.78	.85
18	*Sunday.*							
19	80.9	3.7	79.0	5.6	.970	.37	2.02	.84
20	80.9	2.7	79.6	4.1	.989	.60	1.47	.88
21	80.7	3.2	79.1	4.8	.973	.42	.71	.86
22	79.8	2.3	78.6	3.5	.958	.30	.21	·90
23	78.5	1.4	77.8	2.1	.934	·09	0.69	.94
24	79.4	1.8	78.5	2.7	.955	.29	.92	.92
25	*Sunday*							
26	79.4	3.1	77.8	4.7	.934	.03	1.61	.86
27	81.0	3.0	79.5	4.5	.986	.55	.62	.87
28	81.1	3.6	79.3	5.4	.979	.48	.94	.84
29	81.5	4.2	79.4	6.3	.983	.49	2.31	.82
30	81.7	4.3	79.5	6.5	.986	.51	.40	.81
31	80.2	2.4	79.0	3.6	.970	.42	1.26	.89

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.585	29.677	29.454	0.223	81.7	83.8	78.2	5.6
1	.573	.669	.442	.227	81.6	83.8	78.3	5.5
2	.559	.655	.397	.258	81.4	84.6	78.6	6.0
3	.551	.649	.393	.256	81.2	84.0	78.4	5.6
4	.546	.654	.390	.264	81.1	83.8	78.5	5.3
5	.557	.668	.404	.264	81.0	83.2	78.4	4.8
6	.574	.681	.405	.276	81.0	83.2	78.0	5.2
7	.586	.697	.407	.290	81.8	84.0	78.4	5.6
8	.599	.703	.402	.301	83.6	86.0	79.2	6.8
9	.605	.717	.419	.298	85.2	87.8	79.8	8.0
10	.606	.724	.408	.316	86.5	89.9	79.6	10.3
11	.597	.718	.394	.324	87.3	90.8	80.2	10.6
Noon.	.583	.696	.374	.322	87.9	91.9	80.0	11.9
1	.562	.695	.342	.353	87.6	92.6	79.4	13.2
2	.540	.658	.309	.349	87.1	93.7	80.9	12.8
3	.524	.639	.295	.344	86.5	92.4	80.8	11.6
4	.511	.617	.263	.354	85.8	90.8	80.2	10.6
5	.517	.633	.273	.360	85.2	88.9	79.8	9.1
6	.524	.641	.273	.368	84.2	87.5	80.2	7.3
7	.543	.645	.283	.362	83.1	86.0	80.4	5.6
8	.565	.670	.291	.379	82 9	85.8	79.8	6.0
9	.586	.673	.303	.370	82.4	84.8	80.2	4.6
10	.598	.698	.313	.385	82.1	84.0	80.2	3.8
11	.598	.704	.310	.294	81.9	83.7	78.4	5.3

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	79.6	2.1	78.5	3.2	0.955	10.29	1.08	0.91
1	79.6	2.0	78.6	3.0	.958	.32	.02	.91
2	79.4	2.0	78.4	3.0	.952	.25	.02	.91
3	79.3	1.9	78.3	2.9	.949	.22	0.99	.91
4	79.3	1.8	78.4	2.7	.952	.25	.92	.92
5	79.2	1.8	78.3	2.7	.949	.22	.92	.92
6	79.3	1.7	78.4	2.6	.952	.25	.89	.92
7	79.8	2.0	78.8	3.0	.964	.38	1.02	.91
8	80.7	2.9	79.2	4.4	.976	.48	.55	.87
9	81.2	4.0	79.2	6.0	.976	.43	2.18	.83
10	81.8	4.7	79.4	7.1	.983	.47	.63	.80
11	82.1	5.2	79.5	7.8	.986	.49	.92	.78
Noon.	82.3	5.6	79.5	8.4	.986	.49	3.15	.77
1	81.9	5.7	79.0	8.6	.970	.31	.21	.76
2	81.9	5.2	79.3	7.8	.979	.42	2.91	.78
3	81.7	4.8	79.3	7.2	.979	.44	.66	.80
4	81.4	4.4	79.2	6.6	.976	.41	.42	.81
5	80.9	4.3	78.7	6.5	.961	.26	.35	.81
6	80.5	3.7	78.6	5.6	.958	.26	1.98	.84
7	80.0	3.1	78.4	4.7	.952	.21	.65	.86
8	79.8	3.1	78.2	4.7	.946	.15	.64	.86
9	79.8	2.6	78.5	3.9	.955	.27	.34	.89
10	79.6	2.5	78.3	3.8	.949	.20	.31	.89
11	79.6	2.3	78.4	3.5	.952	.23	.21	.89

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	..	0.26	S.	Cloudy, also raining between 10 and 11 P. M.
2	125.0	..	S.	Scatd. clouds.
3	117.0	..	S.	Scatd. clouds.
4	*Sunday.*			
5	..	2.38	S. & E.	Cloudy, also raining between 1 and 3 P. M.
6	126.8	..	S. E. & S.	Scatd. clouds till 8 A. M. Scatd ⌒i till 3 P. M. cloudy afterwards also drizzling between 8 and 9 P. M.
7	116.6	0.62	S. E. & S.	Cloudless till 5 A. M. Scatd. ╲_i afterwards, also raining between 3 and 4 P. M.
8	115.4	0.26	E. & S. E.	Cloudless till 4 A. M. Scatd. clouds afterwards also raining at 10 A. M. Noon and 5 P. M.
9	..	..	S. & E.	Cloudy, till 5 P. M. cloudless afterwards.
10	124.0	..	S. & E.	Cloudless till 7 A. M. Scatd ⌒i till 3 P. M. cloudy till 7 P. M. cloudless afterwards.
11	*Sunday.*	0.38		
12	..	0.53	N. E. &. E.	Cloudless till 4 A. M. Scatd ╲_i till 9 A. M. cloudy till 4 P. M. Scatd. ╲_i and ⌒i afterwards also raining at 11 A. M. 1, 4, 7, and 8 P. M.
13	..	1.08	N. E. & E.	Cloudy also raining between Noon and 3 P. M.
14	..	0.16	E.	Cloudy, also drizzling occasionally.
15	..	..	N. E. & S. E.	Cloudy nearly the whole day.
16	..	0.66	E. & S. E.	Cloudy also raining occasionally.
17	..	0.12	S. E. & E.	Scatd. clouds till 7 P. M. Scatd. ╲_i afterwards also slightly raining at 2 P. M.
18	*Sunday.*	0.13		
19	116.0	1.20	E. & S. E. & calm	Scatd. ╲_i till 7 A. M. Scatd. ⌒i till 3 P. M. cloudy afterwards, also raining between 6 and 10 P. M.
20	..	..	N. E. & S. E.	Cloudy till 5 P. M. Scatd. ╲_i afterwards.
21	108.0	0.36	E. & S.	Cloudy till 5 A. M. Scatd. ⌒i till 2 P. M. cloudy afterwards also rain at 2 P. M.

╲i Cirri, ╲_i Cirro strati, ⌒i Cumuli, ⌒_i Cumulo strati, ╲⌒_i Nimbi, —i Strait ╲⌒i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the Month of July, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
22	..	2.35	N. W. & W.	Cloudy also raining constantly.
23	..	3.04	S. W. & W.	Cloudy also raining between Midnight and Noon, and at 5 P. M.
24	..	1.61	N. & W. & N. E.	Cloudy also raining between 2 and 6 P. M.
25	*Sunday.*	1.22		
26	..	0.10	S.	Cloudy also raining at Noon.
27	..	0.10	S.	Cloudy also raining at Noon.
28	..	..	S.	Cloudy also very slightly drizzling at 7 P. M.
29	117.0	..	S. & S. W.	Scatd. \\-i and ^i till 4 P. M. cloudy afterwards.
30	131.0	..	S. & calm.	Cloudy till 8 A. M. Scatd. ^i till 4 P. M. cloudy afterwards also slightly drizzling from 7 to 10 P. M.
31	..	1.40	N. E. & S.	Cloudy also raining at 9 A. M. and 1 P. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1858.

MONTHLY RESULTS.

	Inches.
Mean height of the Barometer for the month, ...	29.566
Max. height of the Barometer occurred at 10 A. M. on the 31st, ..	29.724
Min. height of the Barometer occurred at 4 A. M. on the 24th, ..	29.263
Extreme range of the Barometer during the month, ...	0.461
Mean of the Daily Max. Pressures, ...	29.620
Ditto ditto Min. ditto, ...	29.505
Mean daily range of the Barometer during the month, ...	0.115

	o
Mean Dry Bulb Thermometer for the month, ...	83.8
Max. Temperature occurred at 2 P. M. on the 6th, ...	93.7
Min. Temperature occurred at 6 A. M. on the 23rd, ...	78.0
Extreme range of the Temperature during the month, ...	15.7
Mean of the daily Max. Temperature, ...	89.1
Ditto ditto Min. ditto, ...	80.3
Mean daily range of the Temperature during the month, ..	8.8

	o
Mean Wet Bulb Thermometer for the month, ...	80.4
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	3.4
Computed Mean Dew-point for the month, ...	78.7
Mean Dry Bulb Thermometer above computed mean Dew-point, ..	5.1
	Inches.
Mean Elastic force of Vapour for the month, ...	0.961

	Troy grains.
Mean Weight of Vapour for the month, ...	10.31
Additional Weight of Vapour required for complete saturation, ..	1.79
Mean degree of humidity for the month, complete saturation being unity,	0.85

	Inches.
Rained 25 days, Max. fall of rain during 24 hours, ...	3 04
Total amount of rain during the month, ...	17.96
Prevailing direction of the Wind, ...	S. & E. & S. E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1858.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.			2	1	5	2	5		8		1	1	1				4		1
1			2		5	1	6		8	1	1	1	1				4		
2			2		5		6		8		1	1	1				4		
3			2		4		6		7	1	1	1	2	1			2		3
4			2		4		4		9		1	1	2	1			3		2
5	1		3		8		2		8		2	1	1				2		
6	1		4		6		4	1	9		1	1			1	1	1		
7	2	1	4		5		4	1	10		1	1					1		
8			3		5		6	1	10		1	1	1		1				
9	1		2		5		7	1	10		1	1			1				
10	2	1	3	1	4	2	8	1	9		1	1							
11			3	2	4		5		10		2		1	1	2				
Noon.	1		3		5	1	2		9	1	4	2	1	1	2				
1	1		4	3	5	2	2		9	1	3		1		2				
2	1	1	3	1	5	4	2		11	2	2		1	1	2	1			
3	1	1	3	1	3	1	3		11	1	3				3	2			
4			3	1	5	1	3		11		5	2							
5			4		4	2	6	1	10	1	2	1							
6	1		4	1	6	1	5	1	9		1				1				1
7	2	1	4	1	7	2	3	1	8		1	1	2	1					
8	2	1	3	1	8	2	2		10				1						
9	1	1	4	2	7	1	3		10	1			2	1					1
10	1	1	4		7	1	3		10	1			2	1					
11			4	1	7		3		11	1			2						

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	*Sunday.*							
2	29.663	29.712	29.603	0.109	84.0	88.6	80.2	8.4
3	.616	.666	.540	.126	85.6	92.0	80.6	11.4
4	.590	.650	.523	.127	86.1	92.6	81.8	10.8
5	.534	.590	.451	.139	86.1	92.6	81.8	10.8
6	.467	.537	.392	.145	86.2	91.7	82.0	9.7
7	.450	.495	.402	.093	85.4	90.8	82.2	8.6
8	*Sunday.*							
9	.425	.468	.357	.111	84.2	89.4	81.7	7.7
10	.454	.501	.408	.093	83.7	88.1	80.6	7.5
11	.536	.605	.477	.128	84.7	89.8	81.7	8.1
12	.585	.621	.540	.081	84.1	89.0	80.6	8.4
13	.629	.689	.587	.102	83.5	87.0	81.2	5.8
14	.684	.735	.618	.117	84.0	88.6	80.6	8.0
15	*Sunday.*							
16	.586	.641	.530	.111	83.5	87.8	77.6	10.2
17	.614	.661	.566	.095	81.1	83.4	78.4	5.0
18	.589	.633	.530	.103	81.1	86.0	78.6	7.4
19	.579	.624	.522	.102	82.7	88.6	78.8	9.8
20	.583	.657	.513	.144	84.0	89.6	80.3	9.3
21	.521	.576	.417	.159	83.6	89.0	80.6	8.4
22	*Sunday.*							
23	.528	.576	.464	.112	84.7	89.2	81.6	7.6
24	.535	.613	.496	.117	83.0	85.6	80.6	5.0
25	.590	.631	.528	.103	79.2	79.8	77.8	2.0
26	.534	.588	.463	.125	82.9	89.3	78.8	10.5
27	.535	.590	.467	.123	83.3	88.8	79.7	9.1
28	.562	.629	.512	.117	81.4	84.8	78.4	6.4
29	*Sunday.*							
30	.563	.614	.496	.118	81.7	85.3	79.6	5.7
31	.567	.640	.511	.129	83.2	88.2	79.4	8.8

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	*Sunday.*							
2	80.3	3.7	78.4	5.6	0.952	10.19	1.98	0.84
3	81.0	4.6	78.7	6.9	.961	.26	2.50	.80
4	81.9	4.2	79.8	6.3	.995	.62	.33	.82
5	82.0	4.1	79.9	6.2	.998	.65	.30	.82
6	81.8	4.4	79.6	6.6	.989	.54	.45	.81
7	81.2	4.2	79.1	6.3	.973	.40	.28	.82
8	*Sunday.*							
9	81.0	3.2	79.4	4.8	.983	.51	1.73	.86
10	80.4	3.3	78.7	5.0	.961	.31	.76	.85
11	80.4	4.3	78.2	6.5	.946	.11	2.31	.81
12	80.5	3.6	78.7	5.4	.961	.31	1.90	.84
13	80.8	2.7	79.4	4.1	.983	.54	.46	.88
14	80.8	3.2	79.2	4.8	.976	.45	.72	.86
15	*Sunday.*							
16	80.7	2.8	79.3	4.2	.979	.51	.49	.88
17	78.7	2.4	77.5	3.6	.925	9.96	.21	.89
18	78.5	2.6	77.2	3.9	.916	.87	.30	.88
19	79.6	3.1	78.0	4.7	.940	10.09	.63	.86
20	81.0	3.0	79.5	4.5	.986	.55	.62	.87
21	80.8	2.8	79.4	4.2	.983	.54	.49	.88
22	*Sunday.*							
23	81.2	3.5	79.4	5.3	.983	.51	.91	.85
24	80.7	2.3	79.5	3.5	.986	.57	.25	.89
25	77.6	1.6	76.8	2.4	.905	9.79	0.77	.93
26	79.2	3.7	77.3	5.6	.919	.86	1.93	.84
27	79.6	3.7	77.7	5.6	.931	.98	.95	.84
28	79.3	2.1	78.2	3.2	.946	10.19	.08	.90
29	*Sunday.*							
30	78.9	2.8	77.5	4.2	.925	9.96	.41	.88
31	79.0	4.2	76.9	6.3	.908	.74	2.15	.82

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.574	29.706	29.459	0.247	81.6	84.2	78.2	6.0
1	.562	.690	.442	.248	81.4	84.2	77.8	6·4
2	.552	.682	.434	.248	81.2	84.2	78.8	5.4
3	.541	.672	.416	.256	81.2	83.8	78.8	5.0
4	.534	.672	.417	.255	80.8	83.0	78.6	4.4
5	.546	.680	.420	.260	80.7	83.0	78.6	4.4
6	.563	.698	.443	.255	80.6	82.8	78.4	4.4
7	.575	.705	.443	.262	81.1	83.2	78.6	4.6
8	.592	.727	.449	.278	82.9	85.4	79.8	5.6
9	.600	.734	.461	.273	84.0	87.2	79.8	7.4
10	.603	.735	.455	.280	85.4	88.6	79.6	9.0
11	.595	.730	.447	.283	86.1	89.1	79.6	9.5
Noon.	.580	.715	.429	.286	86.8	90.4	79.6	10.8
1	.559	.704	.421	.283	87.6	91.6	79 6	12.0
2	.533	.667	.401	.266	87.5	92.0	79.8	12.2
3	.514	.663	.376	.287	87.4	92.6	79.6	13 0
4	.502	.639	.357	.282	86.5	91.6	82.0	9.6
5	.501	.618	.364	.254	85.5	91.2	79.8	11.4
6	.514	.635	·374	.261	84.6	87.8	79.7	8.1
7	.534	.652	.394	.258	83.4	86.6	77.9	8.7
8	.558	.661	.420	.241	82.8	85.6	77.6	8.0
9	.578	.688	.440	.248	82.6	85.3	78.2	7.1
10	.588	.689	.447	.242	82·2	85.2	77.6	7.6
11	.587	.693	.456	.237	82.0	84.3	78.6	5 7

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	79.4	2.2	78.3	3.3	0.949	10.22	1.12	0.90
1	79.2	2.2	78.1	3.3	.943	.16	.11	.90
2	79.2	2.0	78.2	3.0	.946	.19	.02	.91
3	79.2	2.0	78.2	3.0	.946	.19	.02	.91
4	79.0	1.8	78.1	2.7	.943	.16	0.91	.92
5	78.9	1.8	78.0	2.7	.940	.13	.91	.92
6	78.8	1.8	77.9	2.7	.937	.10	.91	.92
7	79.2	1.9	78.2	2.9	.946	.19	.98	.91
8	80.0	2.9	78.5	4.4	.955	.27	1.52	.87
9	80.5	3.5	78.7	5.3	.961	.31	.86	.85
10	81.1	4.3	78.9	6.5	.967	.32	2.36	.81
11	81.4	4.7	79.0	7.1	.970	.35	.60	.80
Noon.	81.9	4.9	79.4	7.4	.983	.47	.74	.79
1	81.9	5.7	79.0	8.6	.970	.31	3.21	.76
2	82.0	5.5	79.2	8.3	.976	.39	.10	.77
3	81.9	5.5	79.1	8.3	.973	.36	.09	.77
4	81.6	4.9	79.1	7.4	.973	.38	2.72	.79
5	81.0	4.5	78.7	6.8	.961	.26	.46	.81
6	80.8	3.8	78.9	5.7	.967	.34	.05	.84
7	80.0	3.4	78.3	5.1	.949	.18	1.78	.85
8	79.9	2.9	78.4	4.4	.952	.23	.52	.87
9	79.9	2.7	78.5	4.1	.955	.27	.41	.88
10	79.7	2.5	78.4	3.8	.952	.23	.31	.89
11	79.7	2.3	78.5	3.5	.955	.27	.20	.90

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	*Sunday.*	0.13		
2	..	..	S.	Scatd. \i and \—i till 6 A. M. Scatd. clouds till 8 P. M. cloudless afterwards.
3	135.2	..	S. & S. E.	Cloudless till 7 A. M. Scatd. \—i and ⌒i till 8 P. M. cloudless afterwards.
4	135.0	0.16	S. E. & S. & calm.	Cloudless till 3 A. M. Scatd. ⌒i till 8 P. M. cloudless afterwards, also slightly drizzling at 8 P. M.
5	132.0	..	S. & S. E.	Cloudless till 3 A. M. Scatd. \—i and ⌒i till 5 P. M. cloudy afterwards, also slightly drizzling at Noon and 6 P. M.
6	113.8	..	S. E. & calm.	Cloudless till 6 A. M. cloudy till 3 P. M. Scatd. ⌒i and \—i afterwards.
7	124.3	..	N. E. & calm & E.	Cloudless till 7 A. M. Scatd. \—i and ⌒i afterwards, also drizzled at 4 P. M.
8	*Sunday.*			
9	..	0.22	N. E. & E.	Scatd. \—i till 7 A. M. cloudy afterwards, also rained at Noon, 1 and 5 P. M.
10	..	0.16	S. & N. E.	Cloudless till 3 A. M. cloudy afterwards also drizzling between 10 and 11 A. M.
11	..	..	E. & S. & S. E.	Cloudy till 5 P. M. Scatd. \i and \—i afterwards, also drizzled at 11 A. M. and 4 P. M.
12	..	0.27	S. E. & S. & E.	Cloudy, also raining between 9 and 10 A. M.
13	119.0	0.30	S. E. & E.	Cloudy, also drizzling occasionally.
14	114.8	0.71	S. & S. E.	Scatd. clouds also rained at 4 P. M.
15	*Sunday.*			
16	..	0.07	S. & S. E.	Cloudy, also thundering and lightning and raining after sunset.
17	..	2.47	S. W. & S. & W.	Cloudy, also incessantly drizzling the whole day.
18	..	1.36	S. W. & W.	Cloudy, also raining between 4 & 9 P. M.
19	..	..	S. W. & W.	Cloudy the whole day also very slightly drizzled at 1 A. M.

\i Cirri, \—i Cirro strati, ⌒i Cumuli, ⌒—i Cumulo strati, \⌒—i Nimbi, —i Strait, \⌒i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the Month of August, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
20	..	0.36	W. & S. W. & N. W.	Cloudy, also drizzling between 7 and 9 A. M.
21	..	0.16	S. W. & S. & N. W.	Cloudy and also drizzling occasionally.
22	*Sunday.*			
23	..	..	S. & S. E.	Scatd. clouds and also very slightly drizzling at 10 P. M.
24	..	0.69	S. W. & S. & W.	Cloudy and also drizzling constantly.
25	..	3.16	W. & S. W.	Cloudy and also raining and drizzling the whole day.
26	..	0.22	S. & S. W.	Cloudy and also drizzling between Midnight and 1 A. M. and at 11 P. M.
27	..	1.26	W. & S.	Cloudy and also raining at 7 P. M.
28	..	0.14	S. E. & W.	Cloudy and also drizzling occasionally.
29	*Sunday.*	2.56		
30	..	0.25	S. & E. & S. E.	Cloudy and also drizzling occasionally.
31	124.0		S. E. & S. W. & S.	Scatd. └i and ⌒i till 7 P. M. cloudless afterwards.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1858.

MONTHLY RESULTS.

				Inches.
Mean height of the Barometer for the month,	..	..		29.558
Max. height of the Barometer occurred at 10 A. M. on the 14th,		..		29.735
Min. height of the Barometer occurred at 4 P. M. on the 9th,		..		29.357
Extreme range of the Barometer during the month,	..	..		0.378
Mean of the daily Max. Pressures,	..	..	..	29.613
Ditto ditto Min. ditto,	..	..	..	29.497
Mean daily range of the Barometer *during the month,*	..	..		0.116

				°
Mean Dry Bulb Thermometer for the month,	..	..		83.6
Max. Temperature occurred at 3 P. M. on the 4th and 5th,		..		92.6
Min. Temperature occurred at 8 and 10 P. M. on the 16th,		..		77.6
Extreme range of the Temperature during the month,	..	..		15.0
Mean of the daily Max. Temperatures,	..	..	..	88.3
Ditto ditto Min. ditto,	..	..	..	80.2
Mean daily range of the Temperatures during the month,		..		8.1

				°
Mean Wet Bulb Thermometer for the month,	..	..		80.3
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,		..		3.3
Computed Mean Dew-point for the month,	..	..	..	78.6
Mean Dry Bulb Thermometer above computed mean Dew-point,		..		5.0
				Inches.
Mean Elastic force of Vapour for the month,	..	..		0.958

				Troy grains.
Mean Weight of Vapour for the month,	..	..	..	10.28
Additional Weight of Vapour required for complete saturation,		..		1.75
Mean degree of humidity for the month, complete saturation being unity,				0.86

				Inches.
Rained 24 days, Max. fall of rain during 24 hours,	..	..		3.16
Total amount of rain during the month,	..	..	..	14.65
Prevailing direction of the Wind,	..	..	...	S. & S. E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1858.

MONTHLY RESULTS.

Table showing the number of days on whica at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.			1		2		4		8	1	3	1	3	2			4		1
1			1		2	1	4	1	9	2	4	3	2	1			4		
2			1		2		4	1	10	1	3		2	1			3		1
3			1		2		4	1	9		3		1				4		2
4			1		2	1	3		8		3		2	1			3		4
5			2		2		5	2	8		4	1	4	1			1		
6			2		2		5		6		5		4	1	1		1		
7			1		5		6	2	5		3		5	2	1				
8			1		6		3		5		6	1	3		2	1			
9	1	1	1		4		4	1	6		4	1	5	2	1				
10	1		1		2	1	4	1	8	2	4	1	4	1	2				
11	2	1	2		1		6	2	6	1	5	2	3		1				
Noon.	1		2	1	1		6	1	4	1	8	2	2		2				
1			3	1	1		9	1	4	1	4	1	2		3				
2			4		1		7		4	1	6	2	2		2	1			
3			3		2		4		6		7	4	1		3				
4			2	1	2		7	1	6	1	5	3	2	1	1				1
5			2	1	3		6		7		3	2	4	1	1	1			
6			2		3		5	1	8		3		3	1	2	1			
7			2	1	2		4		9	2	4		3		2				
8			2		3		4	1	10	1	3	2	3	1			1		
9			1		3	1	5		10	2	1	1	3	1			2		1
10			1		3	1	5	1	10	3	2		3	1			2		
11			1		2		7		10	3	2		3	1					1

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.668	29.718	29.625	0.093	83.8	88.6	79.4	9.2
2	.704	.763	.647	.116	84.9	90.6	80.4	10.2
3	.695	.772	.628	.144	85.2	90.6	81.6	9.0
4	.644	.708	.554	.154	85.1	89.6	81.4	8.2
5	*Sunday.*							
6	.609	.670	.548	.122	84.3	89.6	80.0	9.6
7	.670	.722	.599	.123	86.0	93.6	81.5	12.1
8	.687	.743	.613	.130	85.7	92.8	82.4	10.4
9	.691	.754	.627	.127	85.4	90.8	81.6	9.2
10	.729	.782	.656	.126	85.5	91.8	81.4	10.4
11	.717	.795	.643	.152	85.2	91.4	81.8	9.6
12	*Sunday.*							
13	.558	.616	.466	.150	88.1	95.0	83.2	11.8
14	.527	.588	.440	.148	89.1	95.0	84.6	10.4
15	.589	.676	.533	.143	82.1	85.4	79.0	6.4
16	.737	.797	.637	.160	83.3	88.5	78.8	9.7
17	.755	.817	.674	.143	83.2	89.9	80.2	9.7
18	.691	.760	.609	.151	83.5	88.6	80.6	8.0
19	*Sunday.*							
20	.584	.643	.504	.139	83.8	88.8	80.2	8.6
21	.597	.651	.539	.112	82.4	86.0	79.8	6.2
22	.656	.741	.593	.148	82.8	87.6	80.0	7.6
23	.734	.805	.679	.126	84.2	89.0	80.4	8.6
24	.755	.825	.696	.129	81.8	84.8	80.2	4.6
25	.758	.818	.691	.127	80.0	82.4	79.0	3.4
26	*Sunday.*							
27	.774	.846	.708	.138	79.8	83.1	78.0	5.1
28	.794	.851	.739	.112	81.0	86.3	78.0	8.3
29	.829	.892	.768	.124	82.7	86.8	79.2	7.6
30	.786	.847	.695	.152	82.7	87.0	79.5	7.5

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	80.2	3.6	78.4	5.4	0.952	10.21	1.89	0.84
2	80.8	4.1	78.7	6.2	.961	.29	2.20	.82
3	80.8	4.4	78.6	6.6	.958	.23	.38	.81
4	81.5	3.6	79.7	5.4	.992	.61	1.96	.84
5	*Sunday.*							
6	81.1	3.2	79.5	4.8	.986	.55	.73	.86
7	81.8	4.2	79.7	6.3	.992	.59	2.32	.82
8	81.6	4.1	79.5	6.2	.986	.53	.27	.82
9	80.9	4.5	78.6	6.8	.958	.23	.45	.81
10	81.1	4.4	78.9	6.6	.967	.32	.40	.81
11	81.4	3.8	79.5	5.7	.986	.53	.08	.84
12	*Sunday.*							
13	83.2	4.9	80.7	7.4	1.024	.89	.83	.79
14	83.8	5.3	81.1	8.0	.037	.99	3.13	.78
15	78.7	3.4	77.0	5.1	0.910	9.79	1.72	.85
16	80.0	3.3	78.3	5.0	.949	10.18	.75	.85
17	80.2	3.0	78.7	4.5	.961	.31	.58	.87
18	80.6	2.9	79.1	4.4	.973	.45	.55	.87
19	*Sunday.*							
20	80.9	2.9	79.4	4.4	.983	.54	.56	.87
21	80.1	2.3	78.9	3.5	.967	.39	.22	.90
22	80.3	2.5	79.0	3.8	.970	.42	.33	.89
23	80.7	3.5	78.9	5.3	.967	.37	.87	.85
24	79.1	2.7	77.7	4.1	.931	.02	.38	.88
25	77.7	2.3	76.5	3.5	.896	9.67	.14	.90
26	*Sunday.*							
27	77.9	1.9	76.9	2.9	.908	.80	0.95	.91
28	78.5	2.5	77.2	3.8	.916	.87	1.27	.89
29	79.7	3.0	78.2	4.5	.946	10.15	.57	.87
30	79.4	3.3	77.7	5.0	.931	.00	.72	.85

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.702	29.834	29.540	0.294	82.0	85.8	78.6	7.2
1	.689	.821	.543	.278	81.7	85.6	78.3	7.3
2	.681	.812	.537	.275	81.4	85.0	78.0	7.0
3	.668	.809	.531	.278	81.4	84.8	78.0	6.8
4	.663	.798	.532	.266	81.0	84.7	78.1	6.6
5	.679	.810	.537	.273	81.2	84.6	78.2	6.4
6	.698	.823	.547	.276	80.9	84.8	78.0	6.8
7	.716	.845	.561	.284	81.2	85.4	78.8	6.6
8	.733	.881	.581	.300	83.3	88.2	79.2	9.0
9	.742	.892	.588	.304	84.3	89.0	77.0	12.0
10	.745	.890	.581	.309	85.5	91.0	79.0	12.0
11	.734	.871	.577	.294	86.7	91.5	79.4	12.1
Noon.	.714	.855	.555	.300	87.7	92.8	80.2	12.6
1	.686	.833	.524	.309	88.1	93.4	81.4	12.0
2	.658	.789	.487	.302	88.1	94.2	81.0	13.2
3	.636	.775	.456	.319	87.7	95.0	81.4	13.6
4	.626	.768	.452	.316	86.7	95.0	79.8	15.2
5	.629	.769	.440	.329	85.6	93.6	79.2	14.4
6	·640	.779	.452	.327	84.4	92.0	79.0	13.0
7	.662	.811	.468	.343	83.5	91.0	79.8	11.2
8	.686	.843	.505	.338	83.3	90.0	79.6	10.4
9	.709	.861	.524	.337	82.8	89.2	79.4	9.8
10	.721	.861	.559	.302	82.5	87.0	79.2	7.8
11	.720	.852	.551	.301	82.3	86.4	79.0	7.4

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Midnight.	79.7	2.3	78.5	3.5	0.955	10.27	1.20	0.90
1	79.6	2.1	78.5	3.2	.955	.29	.08	.91
2	79.5	1.9	78.5	2.9	.955	.29	0.98	.91
3	79.5	1.9	78.5	2.9	.955	.29	.98	.91
4	79.3	1.7	78.4	2.6	.952	.25	.89	.92
5	79.4	1.8	78.5	2.7	.955	.29	.92	.92
6	79.2	1.7	78.3	2.6	.949	.22	.88	.92
7	79.5	1.7	78.6	2.6	.958	.32	.89	.92
8	80.5	2.8	79.1	4.2	.973	.45	1.48	.88
9	80.8	3.5	79.0	5.3	.970	.40	.88	.85
10	81.1	4.4	78.9	6.6	.967	.32	2.40	.81
11	81.5	5.2	78.9	7.8	.967	.30	.88	.78
Noon.	81.7	6.0	78.7	9.0	.961	.22	3.34	.75
1	81.9	6.2	78.8	9.3	.964	.25	.47	.75
2	81.9	6.2	78.8	9.3	.964	.25	.47	.75
3	81.9	5.8	79.0	8.7	.970	.31	.25	.76
4	81.4	5.3	78.7	8.0	.961	.24	2.94	.78
5	81.1	4.5	78.8	6.8	.964	.29	.47	.81
6	80.6	3.8	78.7	5.7	.961	.29	.02	.84
7	80.4	3.1	78.8	4.7	.964	.34	1.66	.86
8	80.3	3.0	78.8	4.5	.964	.34	.59	.87
9	80.2	2.6	78.9	3.9	.967	.39	.36	.88
10	80.1	2.4	78.9	3.6	.967	.39	.25	.89
11	79.9	2.4	78.7	3.6	.961	.33	.25	.89

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	..	0.21	E. & S. E.	Sactd clouds and also raining at 7 A. M. and 6 P. M.
2	..	..	S. & E.	Cloudless till 4 A. M. Scatd clouds afterwards.
3	130.5	..	S. & S. W.	Scatd clouds and also very slightly drizzling at 8 A. M.
4	..	0.12	S.	Cloudless till 6 A. M. cloudy till 6 P. M. cloudless afterwards, also raining between 2 and 3 P. M.
5	*Sunday.*			
6	..	0.65	S. W. & S. & E.	Scatd \i and \–i till 5 A. M. cloudy afterwards also raining at 6 P. M.
7	134.4	..	S. & N. E.	Scatd clouds nearly the whole day.
8	130.8	..	N. E. & S. E.	Cloudless till 3 A. M. Scatd clouds till 7 P. M. cloudless afterwards also very slightly drizzled at 5 P. M.
9	130.8	..	N. E. & Calm	Cloudless till 7 A. M. Scatd \i and \–i afterwards.
10	134.2	0.52	N. E. & E.	Cloudless till 6 A. M. Scatd clouds till 6 P. M. cloudless afterwards, also raining between 3 and 4 P. M.
11	..	..	S. E. & S.	Cloudless till 2 A. M. Scatd clouds till 6 P. M. cloudless afterwards also very slightly drizzled at 3 P. M.
12	*Sunday.*			
13	136.0	..	N. W. & S. E. & S.	Cloudless till 5 A. M. Scatd clouds afterwards, also slightly drizzling at 7 P. M.
14	123.7	..	N. W. & calm	Cloudless till 6 A. M. Scatd clouds afterwards also slightly drizzled between 7 and 8 P. M.
15	..	0.54	N. E.	Cloudy, also drizzling between 3 & 8 P. M.
16	129.0	..	E. & S. E.	Scatd clouds.
17	139.5	0.11	E. & S.	Cloudless till 5 A. M. Scatd clouds afterwards also raining between 3 and 4 P. M.
18	..	0.21	N. E. & E.	Cloudy nearly the whole day also drizzling between 1 and 2 P. M.
19	*Sunday.*	0.16		
20	..	0.48	N. E. & S.	Scatd clouds also drizzling occasionally.
21	..	0.42	E.	Cloudy nearly the whole day also raining at 7 P. M.
22	..	..	N. E. & S.	Cloudy till 7 P. M. Scatd \i and \–i

\i Cirri, \–i cirro strati, ⌒i cumuli, ⌒–i cumulo strati, \⌒–i nimbi, —i strati, \⌒i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
				afterwards also drizzling at 7 A. M. and 7 P. M.
23	..	..	S. E. & E. & S.	Scatd \i & \‒i till 5 P. M. cloudless afterwards.
24	..	..	S. E. & N. E.	Cloudy also slightly drizzling between 2 and 3 P. M.
25	..	0.52	E. & S. E.	Scatd clouds also raining at 8 and 10 A. M. and 1 P. M.
26	*Sunday.*	0.18		
27	..	0.26	E. & S. & S. E.	Cloudy, also drizzling between 7 & 11 A. M.
28	..	0.36	S. & S. E. & E.	Scatd clouds also raining between 8 and 9 A. M.
29	..	..	S. & S. E.	Scatd clouds also very slightly drizzling at 10 A. M.
30	..	..	S.	Scatd clouds.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1858.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.689
Max. height of the Barometer, occurred at 9 A. M. on the 29th, ..	29.892
Min. height of the Barometer, occurred at 5 P. M. on the 14th, ..	29.440
Extreme Range of the Barometer during the month, ...	0.452
Mean of the Daily Max. Pressures, ...	29.754
Ditto ditto Min. ditto, ...	29.620
Mean Daily range of the Barometer during the month, ...	0.134

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Mean Dry Bulb Thermometer for the month, ...	83.9
Max. Temperature, occurred at 3 and 4 P. M. on the 13th and 14th, ..	95.0
Min. Temperature, occurred at 2, 3 and 6 A. M. on the 27th and 28th,..	78.0
Extreme Range of the Temperature during the month, ...	17.0
Mean of the Daily Max. Temperature, ...	88.9
Ditto ditto Min. ditto, ...	80.5
Mean Daily range of the Temperature during the month,.. ..	8.4

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	o
Mean Wet Bulb Thermometer for the month, ...	80.5
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	3.4
Computed Mean Dew Point for the month, ...	78.8
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	5.1
	Inches.
Mean Elastic force of vapour for the month, ...	0.964

	Troy grains.
Mean weight of vapour for the month, ...	10.34
Additional weight of vapour required for complete saturation, ..	1.79
Mean degree of Humidity for the month, complete saturation being unity,	0.85

	Inches.
Rained 22 days. Max. fall of rain during 24 hours, ...	0.65
Total amount of rain during the month, ...	4.74
Prevailing direction of the Wind,..	S. & S. E. & N. E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1858.

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.			5		6		6		6	1							2		1
1			5		6		5		8	1							2		
2			5		6		4		9								2		
3			4		6		3		8								2		3
4			4		8		2		7								2		3
5			4		7		5		7								2		1
6			4	1	7		5		6		1		1				2		
7			5	2	8	1	4		5	1			1		1		2		
8			8		5	1	3	1	4	1	1	1	1		2				2
9	1		6		8	1			6	1	1		2		1				1
10	2		5		4	1	5		5	2	2				3				
11	1		4		7		5	1	5		1		1		2				
Noon.	1		4		7		5		5		1				3				
1	1		3		6		7	1	6	1	1				2				
2	2	1	3		5		8		5	1	1				2				
3	2	1	5	1	3		8	2	6	1	1				1				
4	3		5	1	1		6		8	1	1				2	1			
5	1	1	4	1	3		4	1	11				2		1				
6	1	1	5	2	4	1	4		9				2		1				
7	1	1	2		7	1	4	1	10	1			1		1				
8			3	1	8	1	4		9						1	1	1		
9			3	1	7		5		9				1		1				
10			3		7		5		8		1				1		1		
11			3		7		5		8		1				1		1		

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.746	29.804	29.679	0.125	81.1	84.8	78.6	6.2
2	.785	.848	.728	.120	81.9	87.2	78.2	9.0
3	*Sunday.*							
4	.835	.895	.786	.109	83.2	89.6	79.8	9.8
5	.841	.914	.766	.148	83.7	88.8	79.9	8.9
6	.806	.887	.739	.148	84.0	89.6	79.8	9.8
7	.774	.850	.706	.144	84.5	90.2	80.3	9.9
8	.801	.868	.738	.130	85.3	90.6	80.6	10.0
9	.832	.910	.777	.133	85.3	90.6	80.6	10.0
10	*Sunday.*							
11	.839	.898	.781	.117	84.8	90.6	80.4	10.2
12	.856	.919	.809	.110	83.5	89.8	77.8	12.0
13	.867	.941	.815	.126	83.3	89.8	77.6	12.2
14	.867	.947	.802	.145	83.9	90.4	77.6	12.8
15	.833	.906	.750	.156	83.6	89.0	79.0	10.0
16	.793	.869	.731	.138	81.7	88.7	78.8	9.9
17	*Sunday.*							
18	.850	.913	.800	.113	80.1	88.4	74.3	14.1
19	.857	.933	.800	.133	77.8	87.4	69.2	18.2
20	.855	.941	.797	.144	78 9	87.6	71.2	16.4
21	.858	.930	.794	.136	80.6	89.0	73.8	15.2
22	.867	.937	.800	.137	81.1	89.6	74.0	15.6
23	.817	.891	.748	.143	81.1	89.2	74.0	15.2
24	*Sunday.*							
25	.605	.721	.459	.262	76.4	79.8	74.2	5.6
26	.646	.874	.291	.583	74.2	77.4	71.6	5.8
27	.904	.977	.845	.132	77.7	85 8	69.8	16.0
28	.917	.990	.870	.120	79.8	85.9	75.6	10.3
29	.909	.970	.868	.102	78.5	84.7	73.6	11.1
30	.974	30.049	.913	.136	76.7	83.6	71.0	12.6
31	*Sunday.*							

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	78.8	2.3	77.6	3.5	0.928	9.99	1.18	0.89
2	79.2	2.7	77.8	4.1	.934	10.05	.39	.88
3	*Sunday.*							
4	79.1	4.1	77.0	6.2	.910	9.77	2.12	.82
5	79.7	4.0	77.7	6.0	.931	.98	.09	.83
6	79.8	4.2	77.7	6.3	.931	.98	.19	.82
7	79.7	4.8	77.3	7.2	.919	.84	.51	.80
8	80.7	4.6	78.4	6.9	.952	10.17	.47	.81
9	80.1	5.2	77.5	7.8	.925	9.88	.76	.78
10	*Sunday.*							
11	78.5	6.3	75.3	9.5	.862	.21	3.25	.74
12	76.5	7.0	73.0	10.5	.801	8.57	.43	.71
13	77.2	6.1	74.1	9.2	.830	.91	.02	.75
14	77.6	6.3	74.4	9.5	.838	.97	.16	.74
15	78.0	5.6	75.2	8.4	.860	9.22	2.81	.77
16	77.4	4.3	75.2	6.5	.860	.24	.13	.81
17	*Sunday.*							
18	71.8	8.3	67.6	12.5	.672	7.25	3.56	.67
19	68.4	9.4	63.7	14.1	.591	6.41	.72	.63
20	71.4	7.5	67.6	11.3	.672	7.28	.19	.70
21	73.5	7.1	69.9	10.7	.725	.80	.21	.71
22	73.8	7.3	70.1	11.0	.729	.85	.32	.70
23	74.1	7.0	70.6	10.5	.741	.97	.20	.71
24	*Sunday.*							
25	74.3	2.1	73.2	3.2	.806	8.77	0.95	.90
26	71.6	2.6	70.3	3.9	.734	.02	1.07	·88
27	74.1	3.6	72.3	5.4	.783	.49	.61	.84
28	75.4	4.4	73.2	6.6	.806	.70	2.05	.81
29	73.3	5.2	70.7	7.8	.744	.05	.30	.78
30	70.7	6.0	67.7	9.0	.674	7.33	.47	.75
31	*Sunday.*							

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.824	29.937	29.349	0.588	78.5	82.2	71.6	10.6
1	.810	.926	.329	.597	78.1	82.0	71.3	10.7
2	.801	.924	.310	.614	77.8	81.7	71.0	10.7
3	.796	.913	.291	.622	77.3	81.6	71.0	10.6
4	.798	.934	.341	.593	76.9	81.3	69.8	11.5
5	.810	.946	.393	.553	76.8	80.8	69.8	11.0
6	.837	.974	.521	.453	76.5	80.6	69.2	11.4
7	.859	30.003	.597	.406	77.1	81.8	70.6	11.2
8	.896	.029	.696	.333	80.8	85.6	76.2	9.4
9	.898	.043	.682	.361	81.9	86.0	73.6	12.4
10	.896	.049	.689	.360	83.0	87.0	74.2	12.8
11	.881	.023	.678	.345	84.5	89.2	74.4	14.8
Noon.	.857	.001	.654	.347	85.7	90.2	73.6	16.6
1	.831	29.982	.636	.346	86.3	89.8	75 0	14.8
2	.803	.950	.573	.377	86.9	90.6	75.4	15.2
3	.787	.948	.539	.409	87.0	90.6	75.6	15.0
4	.780	.941	.528	.413	86.2	90.6	75.0	15.6
5	.783	.943	.507	.436	84.8	89.2	75.0	14.2
6	.789	.955	·505	.450	83.0	87.0	74.4	12.6
7	.809	.966	.513	.453	81.7	86.0	73.2	12.8
8	.827	.984	.518	.466	80.8	85.5	72.8	12.7
9	.838	.996	.496	.500	80.0	84.6	72.6	12.0
10	.843	30.002	.462	.540	79.4	83.7	72.0	11.7
11	.841	.005	.459	.546	79.0	83.4	71.6	11.8

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	75.4	3.1	73.8	4.7	0.822	8.89	1.46	0.86
1	75.3	2.8	73.9	4.2	.824	.94	.28	.88
2	74 9	2.9	73.4	4.4	.811	.80	.33	.87
3	74.6	2.7	73.2	4.1	.806	.75	.23	.88
4	74.2	2.7	72.8	4.1	.795	.64	.22	.88
5	74.2	2.6	72.9	3.9	.797	.66	.17	.88
6	73.9	2.6	72.6	3 9	.790	.59	.16	.88
7	74.5	2.6	73.2	3.9	.806	.75	.17	.88
8	76.0	4.8	73.6	7.2	.817	.80	2.27	.80
9	76.2	5.7	73.3	8.6	.809	.68	6.7	.76
10	76.2	6.8	72.8	10 2	.795	.54	3.28	.72
11	76.8	7.7	72.9	11.6	.797	.52	.83	.69
Noon.	77.0	8.7	72.6	13.1	.790	.43	4.37	.66
1	77.2	9.1	72 6	13.7	.790	.42	.60	.65
2	77.6	9.3	72.9	14.0	.797	.49	.76	.64
3	77.2	9.8	72.3	14.7	.783	.32	.97	.63
4	77.0	9.2	72.4	13.8	.785	.36	.63	.64
5	77.0	7.8	73.1	11.7	.803	.58	3.88	.69
6	77.2	5.8	74.3	8.7	.835	.96	2.86	.76
7	76.8	4.9	74.3	7.4	.835	.99	.38	.79
8	76.2	4.6	73.9	6.9	.824	.88	.19	.80
9	76.0	4.0	74.0	6.0	.827	.93	1.88	.83
10	75.7	3.7	73.8	5.6	.822	.87	.75	.84
11	75.4	3.6	73.6	5.4	.817	.84	.66	.84

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	..	..	S. E. & S.	Cloudy, also slightly drizzling at 5 and 11 A. M.
2	135.0	0.10	S. & S. E.	Scatd. clouds till 7 P. M. cloudless afterwards, also drizzling at 3 A. M. and 2 P. M.
3	*Sunday.*			
4	138.4	..	N. W. & S. E. & calm.	Scatd. clouds.
5	..	..	N. W. & S. E.	Cloudless till 5 A. M. Scatd. \—i and ⌒i afterwards.
6	135.0	..	S. & E. & N. W.	Cloudless till 7 A. M. Scatd. \—i and ⌒i till 6 P. M. cloudless afterwards, also slightly drizzling at 1 P. M.
7	147.0	..	E. & S.	Cloudless till 7 A. M. Scatd. \—i and ⌒i till 8 P. M. cloudless afterwards.
8	148.0	..	S. & S. W.	Cloudless till 9 A. M. Scatd. ⌒i till 4 P. M. cloudless afterwards.
9	145.0	..	S.	Cloudless till 9 A. M. Scatd. \—i and ⌒i till 6 P. M. cloudless afterwards.
10	*Sunday.*			
11	145.0	..	S. & N.	Cloudless till 9 A. M. Scatd. \—i till 8 P. M. cloudless afterwards.
12	146.0	..	N. & W.	Cloudless.
13	142.0	..	W. & N.	Cloudless till 9 A. M. Scatd ⌒i till 3 P. M. cloudless afterwards.
14	142.6	..	N. & W. & N. E.	Cloudless till Noon. Scatd. ⌒i till 4 P. M. cloudless afterwards.
15	148.0	..	S. & N. W.	Cloudless till 5 A. M. Scatd. clouds till 7 P. M. cloudless afterwards.
16	136.0	0.08	N. & S. & S. W.	Cloudless till 4 A. M. cloudy afterwards.
17	*Sunday.*			
18	139.0	..	W. & N. W. & N .E.	Cloudless.
19	141.0	..	N. W. & W. & N.	Cloudless.
20	145.0	..	N. & N. W. & W.	Scatd. \i tiill 5 A. M. cloudless till Noon. Scatd. \i till 6 P. M. cloudless afterwards.
21	142.6	..	W. & N. W.	Cloudless.
22	135.0	..	N. W. & W.	Cloudless.

\i Cirri, \—i Cirro strati, ⌒i Cumuli, ⌒—i Cumulo strati, \⌒—i Nimbi, —i Strait, \⌒i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the Month of October, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
23	139.0	..	N. W. & N.	Cloudless till 4 A. M. Scatd. \i and \—i afterwards.
24	*Sunday.*			
25	..	7.85	N. W. & N.	Cloudy, also raining the whole day.
26	..		W.	Cloudy also raining between Midnight to 7 A. M.
27	144.2	..	S. W. & W.	Cloudless till 9 A. M. Scatd. \—i and ⌒i afterwards.
28	140.0	..	S. W. & N. W.	Scatd. clouds till 5 P. M. cloudless afterwards.
29	132.0	..	S. W. & W.	Cloudless.
30	138.0	..	S. W. & W. & N.	Cloudless.
31	*Sunday.*			

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1858.

Monthly Results.

				Inches.
Mean height of the Barometer for the month,	..		..	29.829
Max. height of the Barometer occurred at 10 A. M. on the 30th,			..	30.049
Min. height of the Barometer occurred at 3 A. M. on the 26th,			..	29.291
Extreme range of the Barometer during the month,	..		..	0.758
Mean of the daily Max. Pressures,	..	..	..	29.907
Ditto ditto Min. ditto,	..	..	..	29.754
Mean daily range of the Barometer during the month	..		..	0.153

				°
Mean Dry Bulb Thermometer for the month,	..		..	81.3
Max. Temperature occurred at 2.3 and 4 P. M. on the 8th, 9th, and 11th,				90.6
Min. Temperature occurred at 6 A. M. on the 19th,			..	69.2
Extreme range of the Temperature during the month,	..		..	21.4
Mean of the daily Max. Temperature,	..	..	..	87.6
Ditto ditto Min. ditto,	..	..	..	76.2
Mean daily range of the Temperatures during the month,			..	11.4

				°
Mean Wet Bulb Thermometer for the month,	..		..	75.9
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,..				5.4
Computed Mean Dew-point for the month, ..	..		..	73.2
Mean Dry Bulb Thermometer above computed mean Dew-point,			..	8.1
				Inches.
Mean Elastic force of Vapour for the month,	..		..	0.806

				Troy grains.
Mean Weight of Vapour for the month,	..	..	..	8.68
Additional Weight of Vapour required for complete saturation,			..	2.56
Mean degree of humidity for the month, complete saturation being unity,				0.77

				Inches.
Rained 6 days, Max. fall of rain during 24 hours,	..		..	0.10
Total amount of rain during the month,	..	..	..	8.03
Prevailing direction of the Wind,	..	..		N. W. & W. & N.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1858.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
	No. of days.																		
Midnight.	3	1					2		7		2		4		6		1		1
1	2						2		7		2		5	1	7		1		
2	2						2		7		2		5	1	7	1	1		
3	2						2	1	5		3		5	1	7	1	1		1
4	2				1		2		5		2		5	1	7	1	1		1
5	2				1		2	1	5		2		6	1	7	1			1
6	3				1		1		5		3		4	1	9	1			
7	5		3		1				4		3		4	1	6	1			
8	7		4		2		1		3		1		2		5	1			1
9	8		3		2		1		2		2		3		5	1			
10	6		3	1	4		1		2		1		4		5				
11	5		4		2		2	1	2		3		2		6				
Noon.	6		1		3		2		2		4		2		6	1			
1	6	1	2				2		2		3		4		7	1			
2	4		2		1		1		2	1	4		5		6	1			1
3	5		2		1		1		2		5		3		7	1			
4	5		1		1		2		3		3	1	6		5	1			
5	5	1	1		2		2		3		3		7		3				
6	3	1			2		2		4		2		6		7				
7	3	1			2		2		3		3		7		6				
8	3	1			2		2		3		4		8		3		1		
9	3	1			2		2		4		3		8		3		1		
10	3	1			2		2		4		3		8		3		1		
11	3	1			2		2		5		2		8		3		1		

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.960	30.033	29.914	0.119	76.2	83.4	70.2	13.2
2	.968	.053	.909	.144	76.7	83.8	70.8	13.0
3	.959	.028	.912	.116	78.0	85.2	72.2	13.0
4	.977	.037	.934	.103	77.7	84.6	72.2	12.4
5	30.002	.068	.953	.115	76.6	83.4	71 2	12.2
6	.006	.077	.950	.127	74.9	82.4	69.1	13.3
7	*Sunday.*							
8	29.955	.029	.913	.116	73 7	80.2	68.6	11.6
9	.971	.033	.920	.113	73.9	81.1	68.2	12.9
10	.998	.073	.941	.132	74.2	81.6	68.0	13.6
11	30.008	.082	.953	.129	75.0	80.4	70.6	9.8
12	29.991	.068	.932	.136	73.7	81.2	67 1	14.1
13	.995	.062	.945	.117	72.8	80.8	66.2	14.6
14	*Sunday.*							
15	30.058	.133	30.004	.129	72.5	81.2	64.4	16.8
16	.072	.145	.007	.138	73.8	81.6	67.2	14.4
17	.081	.158	.026	.132	74.9	83.2	67.0	16.2
18	.093	.170	.037	.133	75.0	83.9	67.6	16.3
19	.069	.140	29.989	.151	73.7	82.8	66.2	16.6
20	.065	.147	30.009	.138	73.0	82.0	66.5	15.5
21	*Sunday.*							
22	.035	.127	29.954	.173	72.2	81.2	64.8	16.4
23	29.957	.037	.893	.144	71.6	80.0	64.8	15.2
24	.969	.042	.918	.124	71.3	79.0	65.1	13.9
25	30.021	.093	.954	.139	70.2	78.6	63.2	15.4
26	.066	.146	30.016	.130	70.9	79.0	65.0	14.0
27	.066	.141	29.999	.142	71.0	80.6	62.5	18.1
28	*Sunday.*							
29	.053	.119	30.002	.117	71.7	80.0	64.0	16.0
30	.058	.120	.007	.113	72.9	79.0	67.4	11.6

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	69.5	6.7	66.1	10.1	0.640	6.96	2.70	0.72
2	70.9	5.8	68.0	8.7	.681	7.39	.41	.75
3	72.6	5.4	69.9	8.1	.725	.85	.34	.77
4	72.3	5.4	69.6	8.1	.717	.77	.33	.77
5	70.7	5.9	67.7	8.9	.674	.33	.44	.75
6	67.8	7.1	64.2	10.7	.601	6.54	.74	.71
7	*Sunday.*							
8	68.1	5.6	65.3	8.4	.623	.82	.14	.76
9	67.8	6.1	64.7	9.2	.611	.68	.33	.74
10	68.8	5.4	66.1	8.1	.640	.99	.10	.77
11	68.9	6.1	65.8	9.2	.634	.91	.40	.74
12	67.6	6.1	64.5	9.2	.607	.64	.32	.74
13	66.4	6.4	63.2	9.6	.582	.36	.35	.73
14	*Sunday.*							
15	66.6	5.9	63.6	8.9	.590	.45	.18	.75
16	68.3	5.5	65.5	8.3	.628	.87	.11	.77
17	69.3	5.6	66.5	8.4	.648	7.07	.21	.76
18	69.0	6.0	66.0	9.0	.638	6.95	.36	.75
19	67.4	6.3	64.2	9.5	.601	.56	.40	.73
20	66.9	6.1	63.8	9.2	.593	.49	.27	.74
21	*Sunday.*							
22	66.7	5.5	63.9	8.3	.595	.52	.03	.76
23	65.8	5.8	62.9	8.7	.576	.31	.09	.75
24	65.3	6.0	62.3	9.0	.565	.20	.13	.74
25	63.8	6.4	60.6	9.6	.534	5.86	.19	.73
26	64.5	6.4	61.3	9.6	.546	6.00	.23	.73
27	64.3	6.7	60.9	10.1	.539	5.92	.33	.72
28	*Sunday.*							
29	65.5	6.2	62.4	9.3	.567	6.22	.21	.74
30	67.6	5.3	64.9	8.0	.515	.74	1.99	.77

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	30.014	30.105	29.930	0.175	70.4	75.0	65.5	9.5
1	.007	.091	.928	.163	69.8	74.6	65.0	9.6
2	29.996	.074	.920	.154	69.2	74.0	64.7	9.3
3	.991	.066	.920	.146	68.5	73.8	64.2	9.6
4	.989	.061	.919	.142	68.0	73.2	63.4	9.8
5	30.002	.076	.919	.157	67.5	72.4	62.9	9.5
6	.028	.100	.959	.141	67.5	72.4	62.5	9.9
7	.050	.125	.981	.144	67.8	73.6	62.8	10.8
8	.079	.155	30.004	.151	71.9	77.6	66.4	11.2
9	.090	.164	.028	.136	74.1	78.8	69.6	9.2
10	.086	.170	.023	.147	76.4	80.2	72.9	7.3
11	.065	.139	29.995	.144	78.6	82.2	75.8	6.4
Noon.	.036	.115	.965	.150	80.0	82.6	75.4	7.2
1	.004	.087	.931	.156	80.7	83.7	77.6	6.1
2	29.979	.056	.908	.148	81.2	84.4	78.0	6.4
3	.967	.040	.893	.147	81.0	85.2	77.5	7.7
4	.965	.037	.896	.141	79.3	83.2	76.4	6.8
5	.972	.047	.903	.144	77.9	81.4	74.6	6.8
6	.982	.060	.911	.149	75.9	79.8	72.8	7.0
7	30.003	.076	.932	.144	74.5	79.7	71.5	8.2
8	.021	.096	.943	.153	73.4	78.0	70.0	8.0
9	.030	.105	.958	.147	72.6	77.4	69.0	8.4
10	.032	.113	.960	.153	71.8	76.6	68.2	8.4
11	.028	.114	.962	.152	71.1	75.8	67.4	8.4

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Mid-night.	66.8	3.6	65.0	5.4	0.617	6.80	1.30	0.84
1	66.3	3.5	64.5	5.3	.607	.69	.26	.84
2	65.9	3.3	64.2	5.0	.601	.62	.19	.85
3	65.5	3.0	64.0	4.5	.597	.58	.07	.86
4	65.2	2.8	63.5	4.5	.588	.48	.05	.86
5	64.7	2.8	63.0	4.5	.578	.39	.03	.86
6	64.7	2.8	63.0	4.5	.578	.39	.03	.86
7	64.9	2.9	63.2	4.6	.582	.43	.05	.86
8	66.8	5.1	64.2	7.7	.601	.58	.90	.78
9	67.8	6.3	64.6	9.5	.609	.64	2.43	.73
10	68.7	7.7	64.8	11.6	.613	.67	3.05	.69
11	69.3	9.3	64.6	14.0	.609	.59	.79	.64
Noon.	69.4	10.6	64.1	15.9	.599	.46	4.35	.60
1	69.8	10.9	64.3	16.4	.603	.50	.54	.59
2	70.0	11.2	64.4	16.8	.605	.51	.70	.58
3	70.0	11.0	64.5	16.5	.607	.53	.61	.59
4	69.1	10.2	64.0	15.3	.597	.45	.14	.61
5	69.4	8.5	65 1	12.8	.619	.71	3.45	.66
6	69.8	6 1	66.7	9.2	.653	7.10	2.47	.74
7	69.4	5.1	66.8	7.7	.655	.14	.04	.78
8	69.0	4.4	66.8	6.6	.655	.16	1.71	.81
9	68.4	4.2	66.3	6.3	.644	.06	.60	.82
10	67.8	4.0	65.8	6.0	.634	6.96	.49	.82
11	67.3	3.8	65.4	5.7	.626	.87	.41	.83

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	140.0	..	W.	Cloudless.
2	115.0	..	W. & N.	Cloudless till 4 A. M. Scatd. \—i and ⌒i till 6 P. M. cloudless afterwards.
3	138.8	..	W. & N.	Scatd. \—i till 5 P. M. cloudless afterwards.
4	119.0	..	W. & N. W. & N.	Cloudless till 10 A. M. Scatd. \—i and ⌒i till 6 P. M. cloudless afterwards.
5	140.0	..	N. & E.	Cloudless till 6 A. M. Scatd. \—i and ⌒i till 1 P. M. cloudless afterwards.
6	144.2	..	E. & N.	Cloudless.
7	*Sunday.*			
8	137.0	..	W. &. S. W.	Scatd. \—i and ⌒i till 7 P. M. cloudless afterwards.
9	138.0	..	W. & N. W.	Cloudless till 4 A. M. Scatd. \—i and ⌒i till 5 P. M. cloudless afterwards.
10	134.6	..	W.	Cloudless till 7 A. M. Scatd. \—i and ⌒i afterwards.
11	..	..	W. & N. W.	Scatd. \—i till 3 A. M. cloudless till 9 A. M. Scatd. clouds till 6 P. M. cloudless afterwards.
12	134.0	..	N. W. & W.	Scatd. \—i and ⌒i till 4 P. M. cloudless afterwards.
13	137.0	..	N. W. & W.	Cloudless till 11 A. M. Scatd. \—i and ⌒i till 5 P. M. cloudless afterwards.
14	*Sunday.*			
15	140.0	..	W.	Cloudless till 10 A. M. Scatd. ⌒i till 6 A. M. cloudless afterwards.
16	138.0	..	W. & N.	Cloudless till 9 A. M. Scatd. \—i and ⌒i till 6 P. M. cloudless afterwards.
17	141.0	..	N. E. & N.	Cloudless.
18	143.0	..	N. & N. W.	Cloudless.
19	143.0	..	N. & N. W.	Cloudless.
20	141.5	..	N. & N. W.	Cloudless.
21	*Sunday.*			
22	137.0	..	N. W.	Cloudless till 11 A. M. Scatd. \—i till 7 P. M. cloudless afterwards.
23	139.0	..	N. & N. W. & W.	Cloudless till 10 A. M. Scatd. ⌒i till 4 P. M. cloudless till 8 P. M. Scatd. \—i afterwards
24	133.0	..	N. W. & W.	Scatd. \—i till 10 A. M. Scatd. ⌒i till 4 P. M. cloudless till 9 P. M. Scatd. \—i afterwards.
25	135.6	..	N. & N. W.	Cloudless till Noon cloudy till 6 P. M. cloudless afterwards.

\i Cirri, \—i cirro strati, ⌒i cumuli, ⌒—i cumulo strati, \⌒—i nimbi, —i strati, \⌒i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
26	135.0	..	N. W. & S. E. & N.	Cloudless till 2 A. M. Scatd. \i and ∩i till 3 P. M. cloudless afterwards.
27	139.7	..	N. E. & N. W.	Cloudless till Noon Scatd. clouds till 6 P. M. cloudless afterwards.
28	*Sunday.*			
29	139.4	..	N. & N. E.	Cloudless.
30	..	..	N. & E.	Cloudy also drizzled from 10 till 11 P. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1858.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	30.017
Max. height of the Barometer, occurred at 10 A. M. on the 18th, ..	30.170
Min. height of the Barometer, occurred at 3 P. M. on the 23rd, ..	29.893
Extreme Range of the Barometer during the month, ...	0.277
Mean of the Daily Max. Pressures, ...	30.091
Ditto ditto Min. ditto, ...	29.961
Mean Daily range of the Barometer during the month, ...	0.130

	o
Mean Dry Bulb Thermometer for the month, ...	73.8
Max. Temperature, occurred at 3 P. M. on the 3rd, ...	85.2
Min. Temperature, occurred at 6 A. M. on the 27th, ...	62.5
Extreme Range of the Temperature during the month, ...	22.7
Mean of the Daily Max. Temperature, ...	81.5
Ditto ditto Min. ditto, ...	67.3
Mean Daily range of the Temperature during the month,.. ..	14.2

	o
Mean Wet Bulb Thermometer for the month, ...	67.8
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	6.0
Computed Mean Dew Point for the month, ...	64.8
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	9.0
	Inches.
Mean Elastic force of vapour for the month, ...	0.613

	Troy grains.
Mean weight of vapour for the month, ...	6.71
Additional weight of vapour required for complete saturation, ..	2.27
Mean degree of Humidity for the month, complete saturation being unity,	0.75

	Inches.
Drizzled 1 day. Max. fall of rain during 24 hours, ...	Nil.
Total amount of rain during the month, ...	Nil.
Prevailing direction of the Wind, ...	W. & N. W. & N.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1858.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	7		2		1						1		8		5		1		1
1	8		2		1						1		8		5		1		
2	10		2		1						1		6		5		1		
3	10		2		1						1		5		5		1		1
4	10		1		1								6		6				2
5	7		2		1						2		6		6				2
6	10		2		1						2		5		6				
7	9		4		1						2		4		6				
8	10		3		1				1				5		5				1
9	7		1		1				2				5		10				
10	8		2		1						1		7		7				
11	9		3		3						1		6		4				
Noon.	7		5		1						2		5		6				
1	6		5				1				2		5		7				
2	6		5		1		1				1		7		5				
3	8		2		1		1				1		6		7				
4	2		2		3		1						7		11				
5	2		1		4		1						8		9				1
6	5		1		3		1						8		8				
7	4				2		1		1				9		9				
8	4				2		1		1				9		9				
9	4				2		1		1				10		8				
10	5				3	1	1						10		7				
11	5				2	1	1						10		7				1

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1858.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	30.053	30.119	29.989	0.130	70.2	73.4	68.6	4.8
2	.010	.084	.956	.128	70.1	73.0	68.4	4.6
3	.012	.071	.964	.107	68.6	70.2	67.8	2 4
4	29.979	.053	.906	.147	69.3	76.0	65.4	10.6
5	*Sunday.*							
6	30.021	.098	.972	.126	67.4	75.9	60.6	15.3
7	.031	.124	.979	.145	66.7	75.6	60.8	14.8
8	29.985	.072	.921	.151	65.5	75.2	57.8	17.4
9	30.005	.077	.935	.142	66.3	76.8	58.0	18.8
10	.037	.122	.988	.134	65.6	75.8	57.8	18.0
11	.037	.104	.984	.120	64.7	74.2	56.6	17.6
12	*Sunday.*							
13	29.959	.034	.902	.132	65.2	74.6	57.2	17.4
14	.994	.063	.949	.114	66.2	75.6	57.6	18.0
15	30.026	.110	.977	.133	66.9	75.3	59.4	15.9
16	.009	.086	.965	.121	67.4	76.4	60.0	16.4
17	.034	.132	.983	.149	67.8	76.8	61.1	15.7
18	.037	.110	.992	.118	68.2	77.8	60.2	17.6
19	*Sunday.*							
20	.040	.099	.997	.102	66.6	74.1	62.5	11.6
21	.087	.163	30.035	.128	65.5	74.2	59.0	15.2
22	.085	.172	.037	.135	63.9	72.2	57.4	14.8
23	.053	.141	29.982	.159	64.5	73.8	56.4	17.4
24	.049	.109	30.000	.109	65.6	75.9	58.2	17.7
25	.047	.120	.003	.117	66.5	76.7	57.8	18.9
26	*Sunday.*							
27	.031	.104	29.972	.132	64.6	73.0	57.6	15.4
28	.045	.114	30.002	.112	65.0	74.2	57.6	16.6
29	.081	.156	.029	.127	66.4	77.4	57.6	19.8
30	.105	.206	.057	.149	68.1	78.6	58.8	19.8
31	.065	.147	.005	.142	69.8	78.8	64.6	14.2

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1858.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	67.9	2.3	66.7	3.5	0.653	7.17	0.88	0.89
2	67.9	2.2	66.8	3.3	.655	.22	.81	.90
3	67.0	1.6	66.2	2.4	.642	.09	.58	.92
4	65.7	3.6	63.9	5.4	.595	6.56	1.27	·84
5	*Sunday.*							
6	62.6	4.8	59.7	7.7	.518	5.73	.66	.78
7	60.8	5.9	57.3	9.4	.478	.29	.94	.73
8	59.6	5.9	56.1	9.4	.459	.11	.87	.73
9	60.4	5.9	56.9	9.4	.472	.22	.93	.73
10	59.1	6.5	55.2	10.4	.445	4.95	2.05	.71
11	59.2	5.5	55.9	8.8	.456	5.07	1.73	.75
12	*Sunday.*							
13	59.7	5.5	56.4	8.8	.464	.15	.76	.75
14	60.9	5.3	57.7	8.5	.485	.36	.76	.75
15	62.0	4.9	59.1	7.8	.508	.62	.66	.77
16	62.8	4.6	60.0	7.4	.523	.79	.60	.78
17	62.9	4.9	60.0	7.8	.523	.78	.70	.77
18	63.1	5.1	60.0	8.2	.523	.78	.80	.76
19	*Sunday.*							
20	62.5	4.1	60.0	6.6	.523	.79	.42	.80
21	60.0	5.5	56.7	8.8	.469	.19	.79	.74
22	58.5	5.4	54.7	9.2	.438	4.88	.75	.74
23	58.9	5.6	55.5	9.0	.450	5.01	.75	.74
24	60.1	5.5	56.8	8.8	.470	.21	.79	.74
25	61.6	4.9	58.7	7.8	.501	.55	.64	.77
26	*Sunday.*							
27	59.4	5.2	56.3	8.3	.462	.15	.63	.76
28	59.8	5.2	56.7	8.3	.469	.21	.66	.76
29	60.9	5.5	57.6	8.8	.483	.34	.83	.75
30	63.0	5.1	59.9	8.2	.521	.76	.79	.76
31	64.7	5.1	62.1	7.7	.561	6.17	.78	.78

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	30.029	30.095	29.960	0.135	63.4	71.2	60.2	11.0
1	.020	.085	.945	.140	62.7	70.8	59.6	11.2
2	.010	.065	.936	.129	62.2	69.8	58.4	11.4
3	.002	.064	.930	.134	61.9	69.7	59.0	10.7
4	.002	.084	.934	.150	61.3	69.5	57.8	11.7
5	.016	.097	.943	.154	60.9	69.2	57.2	12.0
6	.033	.112	.962	.150	60.5	69.2	56.6	12.6
7	.056	.147	.981	.166	60.4	69.2	56.4	12.8
8	.090	.181	30.007	.174	63.5	69.6	59.6	10.0
9	.108	.205	.032	.173	66.1	70.8	63.2	7.6
10	.110	.206	.034	.172	68.3	72.0	65.4	6.6
11	.091	.184	.018	.166	71.0	73.6	67.6	6.0
Noon.	.060	.138	29.984	.154	73.2	76.1	70.2	5.9
1	.028	.111	.950	.161	74.5	77.5	70.2	7.3
2	.003	.082	.921	.161	75.1	78.6	69.8	8.8
3	29.990	.073	.906	.167	74.6	78.8	69.2	9.6
4	.984	.062	.902	.160	72.9	76.4	68.6	7.8
5	.991	.063	.907	.156	71.3	75.2	68.2	7.0
6	30.003	.063	·922	.141	69.1	72.4	66.2	6.2
7	.019	.082	.937	.145	67.7	71.7	65.0	6.7
8	.033	.097	.945	.152	66.6	70.0	64.0	6.0
9	.043	.101	.956	.145	65.6	69.4	62.8	6.6
10	.049	.113	.964	.149	64.8	69.8	61.4	8.4
11	.042	.096	.953	.143	64.0	70.0	61.2	8.8

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1858.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon —*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	60.6	2.7	58.6	4.8	0.499	5.56	0.97	0.85
1	60.1	2.6	58.3	4.4	.494	.52	.87	.86
2	59.7	2.5	57.9	4.3	.488	.45	.84	.87
3	59.5	2.4	57.8	4.1	.486	.44	.79	.87
4	59.0	2.3	57.2	4.1	.476	.33	.79	.87
5	58.6	2,3	56.8	4.1	.470	.27	.77	.87
6	58.3	2.2	56.5	4.0	.465	.22	.75	.87
7	58.2	2.2	56.4	4.0	.464	.20	.75	.87
8	60.3	3.2	58.1	5,4	.491	.47	1.08	.84
9	61.7	4.4	59.1	7.0	.508	.63	.47	.79
10	62.6	5.7	59.2	9.1	.509	.63	.97	.74
11	63.7	7.3	60.0	11.0	.523	.74	2.51	.70
Noon.	64.7	8,5	60.4	12.8	.530	.80	3.02	.66
1	65.1	9.4	60.4	14.1	.530	.78	.40	.63
2	65.2	9.9	60.2	14.9	.527	.73	.61	.61
3	64.8	9.8	59.9	14.7	.521	.67	.53	.62
4	63.9	9.0	59.4	13.5	.513	.60	.13	.64
5	64.0	7.3	60.3	11.0	.528	.80	2.53	.70
6	64.0	5.1	61.4	7.7	.548	6.04	1.74	.78
7	63.4	4.3	60.8	6.9	.537	5.94	.52	.80
8	62.8	3.8	60.5	6.1	.532	.90	.31	.82
9	62.3	3.3	60.3	5.3	.528	.87	.13	.84
10	61.7	3.1	59.8	5.0	.520	.77	.06	.85
11	61.1	2.9	59.1	4.9	.508	.65	.00	.85

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	..	0.10	N. E. & E. & N.	Cloudy and also drizzling occasionally.
2	..	0.28	N. E. & N. & E.	Cloudy and occasionally drizzling.
3	..	0.70	N. E. & N.	Cloudy and constantly drizzling.
4	132.0	..	N. W. & N. E. & N.	Scatd. clouds till 4 P. M. cloudless afterwards.
5	*Sunday.*			
6	136.2	..	N. & W. & N. W.	Cloudless.
7	133.4	..	N. W	Cloudless.
8	136.4	..	W. & E.	Cloudless and foggy between 7 till 11 11 P. M.
9	134.0	..	N. & W.	Cloudless.
10	136.6	..	N.	Cloudless.
11	133.0	..	N. & S.	Cloudless.
12	*Sunday.*			
13	130.8	..	N. & N. W.	Cloudless, also foggy between 7 and 11 P. M.
14	135.0	..	N.	Cloudless till 11 A. M. Scatd. ╲—i and ⌒i till 6 P. M. cloudless afterwards.
15	128.0	..	N. W. & N. & W.	Cloudless till 5 A. M. Scatd. ╲i and ╲—i till 3 P. M. cloudless afterwards.
16	137.4	..	N. & N. W. & W.	Cloudless till 11 A. M. Scatd. ⌒i till 4 P. M. cloudless afterwards.
17	135.0	..	N. W. & N. E.	Cloudless.
18	138.9	..	N. & N. W. & E.	Cloudless till 1 P. M. Scatd. ╲i and ╲—i till 6 P. M. clondless afterwards.
19	*Sunday.*			
20	127.4	..	N. W. & N. & W.	Scatd. clouds till 7 A. M. cloudless till 11 A. M. Scatd. ⌒i till 4 P. M. cloudless afterwards.
21	133.6	..	N. & N. W.	Cloudless till 11 A. M. Scatd. ╲—i till 4 P. M. cloudless afterwards.
22	131.5	..	N. W. & N.	Cloudless.
23	131.0	..	N. & N. W.	Cloudless.
24	135.5	..	N. & N. W.	Cloudless.
25	135.2	..	N. & S. W.	Clouldless.
26	*Sunday.*			
27	131.0	..	N. W. & N.	Cloudless.

╲i Cirri, ╲—i Cirro strati, ⌒i Cumuli, ⌒—i Cumulo strati, ╲⌒—i Nimbi, —i Strati, ╲⌒i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the Month of December, 1858.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
28	137.5	..	N. W. & W.	Cloudless.
29	140.0	..	W. & N. W.	Cloudless till 2 P. M. Scatd. \–i till 6 P. M. cloudless afterwards.
30	138.6	..	W. & N. W.	Cloudless till 5 A. M. Scatd. \i and \– till 6 P. M. cloudless afterwards.
31	135.0	..	N. & W.	Cloudless till 7 A. M. Scatd. \i till 3 P. M. cloudless afterwards.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1858.

Monthly Results.

				Inches.
Mean height of the Barometer for the month,		..	..	30.034
Max. height of the Barometer occurred at 10 A. M. on the 30th,			..	30.206
Min. height of the Barometer occurred at 4 P. M. on the 13th,			..	29.902
Extreme range of the Barometer during the month,		..	..	0.304
Mean of the daily Max. Pressures,	..	..	..	30.111
Ditto ditto Min. ditto,	..	..	..	29.981
Mean daily range of the Barometer during the month,		..	..	0.130

				o
Mean Dry Bulb Thermometer for the month,		..	..	66.7
Max. Temperature occurred at 3 4 P. M. on the 31st,		..	..	78.8
Min. Temperature occurred at 7 A. M. on the 23rd,			..	56.4
Extreme range of the Temperature during the month,		..	..	22.4
Mean of the daily Max. Temperature,	..	..	..	75.2
Ditto ditto Min. ditto,	..	..	..	60.2
Mean daily range of the Temperatures during the month,			..	15.0

				o
Mean Wet Bulb Thermometer for the month,		..	..	61.9
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,			..	4.8
Computed Mean Dew-point for the month,	..	..	..	59.0
Mean Dry Bulb Thermometer above computed mean Dew-point,			..	7.7
				Inches.
Mean Elastic force of Vapour for the month,		..	..	0.506

				Troy grains.
Mean Weight of Vapour for the month,	..	..	..	5.60
Additional Weight of Vapour required for complete saturation,			..	1.63
Mean degree of humidity for the month, complete saturation being unity,				0.78

				Inches.
Rained 3 days, Max. fall of rain during 24 hours,		..	..	0.70
Total amount of rain during the month,	..	..	..	1.08
Prevailing direction of the Wind,	..	..		N. & N. W. & W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1858.

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
	No. of days.																		
Midnight.	9		2	1	2	1			1				3		9				1
1	10		2	1	2	1			1				3		9				
2	11		2	1	2	1			1				3		8				
3	10		2	1	2								4	1	8				1
4	11		2	1	2								4		8				
5	10		3	2	1								4		9				
6	8		2	1					2				8		7				
7	8		3	1			1						8		7				
8	9	1	2						1		1		3		10				1
9	13		2		2						1		2		7				
10	12		4		1				1				4		5				
11	9		2		2		1		1		1		4		7				
Noon.	5	1	1		2		1		1				3		14				
1	6				1		1				1		7		11				
2	7	1	1								3		8		8				
3	5		1	1	1						3		9		8				
4	9	1	1				1	1			3		7		5				1
5	10	1	2	1	1						2		6		6				
6	9	1	4	1	1				1		1		5		6				
7	10		4		1				1		1		5		5				
8	11		4	1	1				1				5		5				
9	11		4	1	1				1				5		5				
10	12		3		1				1				5		5				
11	11		3		1				1				5		5				1

ERRATA IN THE JOURNAL FOR 1858.

VOL. XXVII.

Page 230, notes, last line *for* adjective *read adjection.*
„ 235, notes l. 3 ab infra *read* सर्वान्.
„ 240, notes, l. 15 *for* and *read* are.
„ 248, notes, l. 6 *for* यार *read* योर.
„ 249, notes, l. 2 *for* Gautama *read* Gotama.
„ „ notes, l. 4 *for* Ras *read* Rao.
„ 302, l. 14 *for* occidental *read* accidental.
„ 303, l. 23 *read* अक्रणिन् and अंशुजाल.
„ 305, l. 20 *for* which *read* while.
„ 313, l. 1 *for* ياني اتمام يافت *read* اتمام يافت باني

The conclusion of Mr. Hodgson's paper, given in this Vol. having been sent to England for his revision, we are enabled to publish his corrections.

The Editors are glad to find that in this part (the MS. having been legible throughout) there are hardly any errors of importance.

We give the following extract from Mr. Hodgson's letter.

"The errata amount to little more than a perseverance in that titular misnomer whereby comparative vocabularies of the empirical kind were confounded with grammatical treatises. Papers one and two, on the languages of the broken tribes and on the dialectic differences of the language of the Kiranti tribe, were of the former sort. Papers three and four on the Vayu and Bahing, were of the latter sort, and should therefore have been kept apart, as well from each other as from the preceding papers, even though you had determined to throw the descriptive part of Vayu and Bahing to the *end* of the papers on them. Whereas you have run the whole of the four papers into one, under the style and title of "Comparative Vocabulary of the languages of the broken tribes of Nepal," a designation which is true only in regard to the FIRST *of these four papers;* for the Kirántis are *not* one of the broken tribes; nor is there the least affinity between the empirical treatment of the vocabularies of both one and the other and the grammatical analyses which follow, though of the samples of language chosen for this analysis, one belonged to a tribe classed with the broken, and the other to a tribe classed among the septs or clans of the Kirantis.

Therefore I have erased the heading of the part now returned to you (Comparative Vocabulary, &c.) and substituted "grammatical analysis of the Bahing

dialect of the Kiranti language;" and, for the top of each successive page, "Bahing grammar" in lieu of Bahing Vocabulary."

Page 393, Declension, case 7, dele All.

„ 396, dele comma between that and which, voce Relative of all genders: and in the note *for* it *read* The relative.

Page 399, *for* kwag-namme *read* kwagnamme.

„ 409 *for* Transitives in to *read* Transitives in do.

„ 421, to the note *add* For a paradigm of transitives in "to" which change the t into d, see on to pages 439-441.

Page 438 *for* Jito be *born read* Jito be *torn*.

Bottom of same page in note *for* Dravidianum *read* Dravidianism.

To note at page 443 *add* It is published as No. XXVII. of Extracts from the Records of the Government of Bengal.

Page 446, l. 7 *for* fermed *read* formed.

„ 450, l. 4 *for* pasung *read* Pasung.

„ „ l. 22 *for and* superest ager, *read et* superest ager.

„ 454, 5 lines from bottom *after* of good size *add* a comma.

CORRIGENDA AND ADDENDA

To the papers on the languages of the broken tribes of Nepal, &c. —*By* B. H. Hodgson, *Esq. B. C. S.*

[*See Journal*, Nos. V. and VI. for 1857.]

[We have received from Mr. Hodgson the following list of the corrections and additions which he has found it necessary to make in his papers published in Vol. XXVI. We have already stated in a former number that much of the MS. was left with us in a very rough and illegible state, and in spite of every care, many errors could not but creep in. In fact it was only at Mr. Hodgson's own earnest wish, that we consented to have it printed at all, as we did not consider the MS. in a fit state for publication. We therefore gladly publish the list in full, by way of an appendix to the whole series of communications; for the *additions*, of course, we are not responsible, as they were not in the original MS.

We may also add that the latter half of the series of papers was fairly legible; and we are gratified to notice that throughout that portion the errors are very trifling. Had all the MS. been in the same condition, we could, with infinitely less trouble to ourselves, have given *the whole* with equal correctness.—Eds.]

Page 318, line 2 from bottom *for* 5-5 *read* 5-12.
 „ 319, „ 6 from top *for* Baking *read* Bahing.
 „ 322, col. Hayu line 13 add note, Ang, Ung, Á = my, thy, his, &c. Angmu, Ungmu, Amu = mine, thine, &c. and so in plural. See on to complete view of this tongue in sequel.
Page, 322 col. Hayu between lines 13 and 14 add A or Amu.
 „ „ „ „ line 15 dele A-mu.
 „ „ „ „ „ 16 *for* Ang-ku *read* Ang-ki.
 „ „ „ „ „ 18 *for* Ún-ni-ma *read* Ún-ni-mu.
 „ 323 „ Pahri „ 4 add note, Gu is the minor sign; hma, the major. They are affixed to all qualitives, numeral, pronominal and other: see on.
Page 324 col. Pahri line 16 *read* Guhm*a* and add note. See note at the word ten.
 „ 325 „ „ „ 13 add note, Dha is sometimes substituted for, and sometimes superadded to, the major sign or hma, as in Newari, to which tongue the Pahri bears a close resemblance.
Page 333 and onwards, as the heading of the pages *for* "*languages of the broken tribes of Nepal*" *read* "*dialects of the Kiránti language.*"

Page 333 col. Rodung line 18 add note. In this and the following columns sá prefixed means flesh. It is the segregative and is dropt as usual in composition, thus in column two, pí being cow, pí yúba or pí yúva is cow's horn and not pí sayuba, see on to the word skin.

Page 334 col. Rodung line 6 add note. Literally cow its male its calf. This is the general way of expressing a possessive or genitive : See father and mother and the 3rd possessive pronoun. It will be seen that the latter in its conjunct form is a general prefix to the radical word wherever relationship can be predicated even when a noun stands alone, thus, umpa = father, literally his father, pater illius vel istius. But the prefix is often used when no relationship exists or can be imagined, thus, ú kholen = day in column 2nd. In fact it is nearly an inseparable particle.

Page 334 col. Rúngchhénbúng, line 32 dele Pá.

„ 335 „ Chowrasya, line 30 add as note on *ápó*.—For change in the root, pá to pó see Báhing in sequel, and observe, the root can *never* be used *alone*.

Page 335, col. Kúlung'ya, line 33 dele pá.

„ 336 „ Rodong „ 9 *for* Chhong gara *read* Chhonggarachha.

„ „ „ „ „ 32 dele ma.

„ „ „ Rúngchhénbúng between lines 23 and 24 *for* womau *read* woman.

„ „ „ „ „ 32 *for* má *read* euma.

„ „ „ Chhintángya l. 20 *for* Pá *read* Upá.

„ „ „ „ „ 27 dele ma.

„ „ „ Náchheréng „ 30 dele ma.

„ „ end of the note *for* Thul *read* Thulung.

„ 337 col. Yákha line 32 dele ma.

„ „ „ Kulúng'ya l. 31 dele ma.

„ „ „ Thulungg'ya l. 38 add note, gna-u = gna-wa, and gnawa, gnami like tawa tami, boy and girl, in Vayu.

Page 337 col. Thulungg'ya l. 4 from bottom *for* Résépmá grain *read* Résép-má Má is grain.

Page 337 col. Thulungg'ya l. 2 from bottom *for* Upáp Bheḍa *read* Upápbhéḍa.

Page 338 col. English l. 30 add note, Dual omitted accidentally. It exists generally. The note below gives it for Rungchhen.

Page 338 *dele* note* and read as follows.—See note at bone and at calf. U'-hok'wa = its cover : Sáhokwa flesh cover. So Singhokwa is tree cover or bark.

Page 338 col. Nachheréng l. 22 dele note†.

„ „ „ Rúngchhénbúng l. 32 add § at the word Ungkang.

„ „ „ „ l. 36 *read* O Ko &c. as in singular.

„ „ „ „ l. 39 dele § at the word Ungkung.

„ „ l. 2 from bottom *read* sign of number.

„ „ l. 1 „ *read* vel Oko-chi, vel Euyakochi.

„ 339 col. Thulungg'ya l. 16 *read* Nepsung, sunshine. Nem sun.

„ 340 „ English l. 5 add note. The two forms of these possessives were not obtained in the plural. Perhaps from insufficient questioning whereby the dual was missed.

Page 340 col. English l. 7 dele * and also the note.

„ „ „ „ l. 23 *for* Conj. *read* Acc. and dele § and also the note.

„ „ *for* notes † and ‡ *read* Eukta is the separate form ; and so also heusa sumya, &c. chha is for beings, and pop for things, thus eukcha mana is one of human kind, eukchha duwachha one man, eukchha menchhachha, one woman ; euk pop topti, one hat. Bangpang for the major and pop for the minor is Mikir. Other segregatives were named to me but confusedly, and if they be proper to Kiranti they are fast becoming obsolete.

Page 340 col. Rodung dele Chi, D. Nin, &c.

„ „ „ Rúngchhénbúng l. 4 *for* Eukhha *read* Eukchha.

„ „ „ „ l. 6 dele unchanged.

„ 341 col. Thulungg'ya l. 7 *for* Ni *read* humans.

" " " " l. 8 *read* animals and things. Ní, root.
" " " " l. 10 add and things.
" " " " l. 12 *for* Gnolo *read* Gnole.
" " " " l. 23 *for* Kwongus-ang Ko-dyum" *read* Kwongusangkodyum.
" 342 col. English dele No genders D. and Pr. &c.
" " " " l. 13 dele note *.
" " " " l. 16 add note. There is no relative when, and then is not properly a correlative. The native equivalents ab, jub, &c. and cho, yu, khu, infra, are from Urdu and Newari and were used only to prevent misapprehension when questioning.
Page 342 col. English l. 26 *for* (chó) *read* above.
" " " " l. 27 dele above.
" " " " l. 28 dele Below (yu).
" " " " l. 29 *for* (Khu) *read* Below.
" " " Rodung l. 5 dele Hic hæc hoc, &c.
" " " " l. 7 *for* ditto *read* Hya ko.
" " " " l. 8. *for* Dósó *read* Tyako, *for* Tyaho *read* Tya and add note, Hya and Tya, are of all genders. Their dual and plural are formed as in the next dialect.
Page 342 col. Rúngchhénbúng l. 8 dele Oko*
" " " " l. 9 dele Okochi &c.
" " " " l. 10 dele Sin. Pl.
" " " " l. 11 *for* Hynoko &c. *read* Mo.
" " dele note*.
" " dele note†.
" " add in the 2nd line in the bottom Chi is the dual and nin the plural sign for all.
" " last line at bottom dele subs.
Page 344 col. English l. 2 dele Up &c.
" " " " l. 27 dele Dual, Plural.
" " " Rúngchhénbúng l. 2 dele Dhutnang &c.
" " " " l. 29 *read* Im'sa, Singular.
" " " " l. 34 *for* (so shitése, *read* (so shit = esei—*and for* Piss chesa *read* Piss = chesa).
Page 344 add at bottom as note, Chi and nin, passim, are the dual and plural signs.
" 346 col. English l. 5 dele sign * and note.
" " " " l. 6 dele sign * and note.
" " " " l. 16 dele sign ‡ and note.
" " " Rodung l. 17 dele note.‡
" " " Rúngchhénbung l. 10 add note That is, puang, give to me, makes puang chang in dual and puang nang in plural; but pú, give to any, makes pu-chi dual and pu-nin, plural. So Né = take from me has chi and nin for dual and plural: but battu = take generally has chu for dual and num for plural.
Page 346 col. Rúngchhénbung l. 27 *for* yen mettu *read* yeng mettu and dele khangmúsá?
Page 346 col. Rúngchhénbúng l. 29 add as a note,—Mettu is causal and yeng mettu is cause to see, khang mettu, cause to hear, both used for tell.
" " " " l. 3 from bottom *for* Khan *read* Khang.
Page 346 at the end *for* note note § *read*—Generic signs stick to numerals but can't attach to the adjective, e. g. nuwa mana, euk chha nuwa mana nuwa chúpi, euk pop nuwa chúpi. In Newari these segregatives attach to both numeral and adjective, thus chhahma bhinghma mana = eukchha nuwa mana and chhagu bhing-gu chupi = eukpop nuwa chúpi.
Page 348 col. English l. 1 dele sign * and note.
" " " " l. 14 dele Circular.
" " " " l. 18 dele Unlevel, uneven.†
" " " Rúngchhénbúng l. 1 and 2, dele notes.†

„ „ at the end *for* former *read* = great. Pang vel bang vel wang is the same as the numeral suffix.

„ 350 col. Bálálí l. 14 add‡.

„ 350 „ Lóhóróng l. 23 dele fresh, and add §.

Page 351 col. English l. 11 dele||.

„ „ „ Báhing, l. 20 add||.

„ „ „ Lóhóróng l. 8 *for* Pepasá *read* Pipasá.

„ „ l. 5 from the bottom *for* Dangmaling *read* Dúngmali, ng.

„ „ l. 3 from bottom *for* Búcha Lámi *read* Búcha and Lámi.

„ „ l. 2 from bottom *for* Séthe *read* Sé.

„ „ at the end *for* any one's filius istius. *read* any one's child, filius istius or illius.

„ 352 col. English l. 3 dele Wa tami my girl.

„ „ „ Lóhóróng l. 5 add sign || and note "There is no proper name for son and daughter, the words are the same as those for boy and girl, nor to these can the 1st or 2nd pronoun prefix be added, as the 3rd is, nor would that serve the turn, umpasa being filius cujusvis and hence um being the almost inseparable adjunct of nouns. See the words father and mother and the pronouns possessive. In Báhing there is an anomalous change of the radical word however which must be remembered."

Page 352 col. Báhingyá l. 19 dele Mo po dad and Mam po.

„ „ „ „ l. 22 dele ipo thy, apo his.

„ „ „ Lóhóróng l. 2 add = my.

„ „ „ „ l. 24 dele Pá. Ung pa, &c.

„ „ „ Lambichhong l. 17 dele Pa

„ „ „ Sángpáng l. 1 *for* Ar' *read* Aa.

„ „ „ Dúngmalí l. 19 dele Pa, and add note "Throughout this column the prefixing of the possessive pronoun sign is indispensable. The root pá cannot be used alone. The further change of pá into pó is peculiar to Báhing."

Page 353 col. Lóhóróng l. 2 dele gen. sign.

„ „ „ „ l. 5 dele Lang leg.

„ „ „ „ l. 6 add note Throughout this column kholi and lan, lang, lak are = leg; and blem tem, phek phak are segregatives or rather one segregative used for flat things. See arm and leg and compare hand and foot.

Page 353 col. Lóhóróng l. 9 add note Sing = tree in this and next column is segregative. Sing i-sa is literally tree its fruit.

Page 353 col. Lambichhong l. 9 dele (ma fœm, passim.)

„ „ „ „ l. 10 *read* mendima.

„ „ „ Báláli l. 11 *for* Mithu *read* Mithi.

„ 354 „ Báhing. l. 6 *for* arms *read* arm.

„ „ „ Lóhóróng l. 6 add all and only.

„ „ „ „ l. 8 *for* arms *read* arm.

„ „ „ Lámbichhóng l. 7 add flat arm.

„ „ „ „ l. 12 dele "sá gen. sign.

„ „ „ Bálali l. 8 add sign * and arm flat.

„ „ „ Sángpúng l. 8 add arm flat.

„ „ „ Dúmi l. 6 *for* head *read* Do = head.

„ „ „ Khaling l. 6 add flat arm.

„ 355 „ Báhing l. 18 dele Mo.*

„ „ „ Lóhóróng l. 23 dele Ma. Ma.

„ „ „ Lámbichhóng l. 16 dele Ma.

„ „ „ Báláli l. 19 dele Má.

„ „ „ Sángpúng l. 17 dele Má.

„ „ „ Dúngmáli l. 16 dele Má.

„ 355 l. 11 from bottom *for* as ad doubled and *read* always added but,—and add See arm and hand, leg and foot.

Page 356 col. Báhing. l. 7 dele from so to signs and add note—Gna-wa gna-mi agree with ta-wa, ta-mi, &c. but pa-sang ma-sang of column 6th makes the sex signs prefixual. Dumi and Khaling, W. compare Dihong of Assam.

Page 356 col. Báhing. l. 20 dele = Kho-la Dihong of Asam.
„ „ „ Lóhórong l. 11 *for* no *read* not and add sign*.
„ „ „ „ l. 20 dele Sing hok' tree skin = bark.
„ „ „ „ l. 22 dele flesh cover.
„ „ „ Lámbichhóng l. 6 *for* root sex repeated *read* root : sex sign repeated.
„ „ „ „ l. 8 add ditto.
„ „ „ „ l. 19 add cover.
„ 357 „ Sángpáng l. 22 add U-yu.
„ „ „ Dúngmáli l. 10 dele sky bird and sign *.
„ „ l. 1 notes, dele from see flesh to sa *and for* see other paper *read* So also sing in sing hok = tree cover or bark. Hok or hokwa if alone takes the inseparable pronoun prefix, hence umhowka = its cover, but if sá be used the compound sahokwá needs no such pronoun adjunct.
Page 357 at bottom add See on to note at His, Her's Its.
„ 358 col. English l. 9 dele Thee.
„ „ „ „ l. 11 dele Himself.
„ „ „ Báhing. l. 5 *for* Sevalachá *read* Swalachá, and add note Swalacha, m. Swalami, f. Here the suffix chá takes the place of wá in gna wa gna mi, &c. aforegone.
Page 358 col. Báhing. l. 9 dele Na.
„ „ „ „ l. 12 dele O-ú.
„ „ „ Lóhórong l. 9 dele Hana.
„ „ „ „ l. 11 dele Mo. Mose.
„ „ „ Lámbichhóng dele l. 8 and 9.
„ „ „ „ l. 11 *for* Toma *read* Tona.
„ „ „ „ dele l. 12 and add note,—The 3rd pronoun is always minutely specific, not merely as the person referred to is near or far off the speaker but as he is on a level, or above or below him. Yona Mona Tona mark these latter distinctions.
Page 358 col. Báláli l. 10 dele Mo ó.
„ 359 „ Báhing. dele l. 3.
„ „ l. 2 from bottom add See p. 171.
„ „ last line *for* Akoi sing *read* Akoim sing,—and add—See back to note at Plant.
Page 360 col. English dele l. 3, 4, 5, 6.
„ „ „ „ l. 9 dele generic signs S. D. P.
„ „ „ Báhing. dele l. 6, 7, 8, 9.
„ „ „ Lámbichhóng l. 4 add note—In Lambichhong Balali, &c. the dual and plural are not throughout discernible.
Page 360 col. Lámbichhóng dele ls. 11, 12, 13, 14, 15, 16, 17, 18, 19 and 20,—these being merely author's notes of comparison with the Dravida tongues.
Page 360 col. Bálali l. 9 add Hippang.
„ „ „ „ l. 10 add Sumbung.
„ „ „ „ l. 11 add Libang.
„ „ „ Sáng-páng l. 5 add Euli.
„ „ „ „ l. 6 add Hissali.
„ „ „ „ l. 8 add Sumkali.
„ „ „ „ l. 10 add Lakkali.
„ „ „ Dúngmáli l. 7 *for* m. po *read* m : Po.
„ 361 col. English dele ls. 8, 9, 10.
„ „ „ Báhing. l. 14 add note,—Genitive sign rarely used, never when two words united as horse's foot, silver jug, &c. 1st of two nouns by position alone is genitive.
„ „ „ Lám. dele ls. 1—5.
„ „ last line dele 1 cow, 2 cows *and for* &c. *read* two men &c. The separate form is Itta = Ikku of Balali.
Page 362 col. English and Báhing. lines 14—17, *read* thus :

Above, on top. { A juju di *(its head in).*
Hátyu. Apiye di.

Below, on bottom. { Háyu. Apum di. *(its bottom or base in).*

„ „ „ „ l. 18 dele on middle.

„ 363 col. English l. 19 *for* primitive *read* privitive.

„ „ 1st line from bottom *for* Hona *read* Khona.

„ „ 2nd line from bottom *for* wa *read* wo—in the same line *for* wa *read* wo.

„ „ 5th line from bottom *read* up, &c. Kugna *for* up, Kugna.

„ „ 6th line from bottom add 1 before Pi-gna—add 3 before Pi-Rá add 1 before Pi-te.

Page 363 add in the bottom,—See prepositions, adverbs and verbs in sequel. The expression of position is thrown as much as possible on the verbs, there being very few proper adverbs, thus go up is either ascend, or, its top to go.

Page 364 col. English l. 2 dele Dual Pl.

„ „ „ Báhing. l. 5 *for* Syu, seú, &c. *read* Caret.

„ „ „ „ l. 15 dele tung-o.

„ „ „ „ l. 23 dele syo.

„ „ col. Lóhóróng l. 9 dele causal mette.

„ „ „ „ l. 12 and 17 add D.

„ „ „ „ l. 13 add Pl. chai mette and add note,—Mette is every where the causal, thus chaye makes chayemette and Dunge Dungmette, Ime Immette and Poge Pogmette.

Page 364 col. Lóhóróng l. 14 dele Dung mette Cha cho mette.

„ „ „ „ l. 18 add Pl.

„ „ „ „ l. 19 dele Immette.

„ „ „ „ l. 20 *for* Ipseche *read* Imache.

„ „ „ „ l. 24 add C.

„ „ „ „ l. 27 *read* Icheche, D. Ichane, Pl.

Page 365 col. Lohorong l. 2, 16, 19, 22, 25, 28, 31 add D.

„ „ „ „ l. 3, 8, 11, 14, 17, 20, 23, 26, 29, 32 add Pl.

„ „ „ „ l. 5 add or and dele mete.

„ „ „ „ l. 6 add or.

„ „ „ „ l. 7 *for* —che *read* —gache and add D.

„ „ „ „ l. 10 *for* —che *read* —ache and add D.

„ „ „ „ l. 13 *for* —che *read* —ache and add D.

„ „ „ Lámbichhong l. 27 dele Pita.

„ „ „ „ l. 28 *for* chu *read* Piruchu and after P add note—Pirang give to me makes dual in ching and plural in ning: but pira give to any, has chu and nu respectively.

Page 365 col. Khaling after l. 10 add Biye.

„ 366 col. Báhing. l. 5 *for* Tyú-po *read* Lommette causal.

„ „ col. Lohorong l. 2 dele Lom-mette.

„ „ „ „ l. 5, 10, 22 add D.

„ „ „ „ l. 6, 23, 28 add P.

„ „ „ „ l. 8 dele Its causal Sed mette.

„ „ „ „ l. 11 add P. causal Sed mette. Sed metta che D. Sed mettane, Pl.

„ „ „ „ l. 16 *for* —che *read* Ladappache D.

„ „ „ „ l. 17 *for* Ladapam *read* Ladapamne P.

„ „ „ „ l. 18 dele —ne.

„ „ „ „ l. 20, 25 add vel.

„ „ „ „ after l. 24 add Yuksache D. Yuksamne P.

„ „ „ „ l. 27 *for* —che *read* Thepogache D.

„ „ „ Dúngmáli l. 13 *for* Kha-ye *read* Kha-de.

Page 367 col. Lohorong l. 15 *for* —che *read* Isache.

„ „ „ „ l. 18 add D.

„ „ „ „ l. 19 dele not good.

„ „ „ „ l. 20 *for* meha *read* miha P.

„ „ „ „ l. 21 add chia-miha.

Page 367 col. Lóhóróng l. 23 *for* ne-ma *read* ne-ohia-mia.
" " " " after l. 26 add —mia.
" " " Lámbichhóng l. 1 to 4 dele Numda, &c. down to suffix.
" " " " l. 12 dele yuk = yak.
" 368 col. Lóhóróng l. 2 & 8 add D.
" " " " l. 3 & 9 add P.
" " " " from lines 12 to 15 dele Tum te &c. and add The verbal forms are Tumte, imperative. 1. Tumtigna. 2. Tumtane. 3. Tumta, indicative.
Page 368 " " l. 17 dele limte.
" " " " l. 19 to 21 dele Lim ku gna, &c. and add so also Limte. Be sweet whence Indicative Limtigna vel Limukgna, I am sweet, &c. And Khiktigna vel Khikgna. I am bitter, &c.
Page 368 " " l. 23 *for* not *read* sweet not.
" " " " dele lines 26 to 29.
" " " " l. 30 & 34 add D.
" " " " l. 31 & 35 add P.
" " " Lambi. l. 1 dele Bon est.
Page 369 col. Lóhóróng l. 3 add --chia D.—mia P.
" " " " l. 5 add mia.
" " " " l. 7 add—chia-mia.
" " " " l. 11 *for* Bí ha *read* vel.
" " " " l. 12 add to Biye—chia—mia.
" " " " l. 15 add to Phíye—chía-mia.
" " " " l. 16 add chía-mia.
" " " " dele foot note.
" 370 col. Báhingyá l. 2, 3, 5, 7, 11, 12, & 13 add—daasi and—daa.
Page 371 col. English l. 2 *for* of *read* or.
" " transfer lines 9 and 10 above lines 6 to 8.
Page 371 col. Báhingyá l. 2 & 4 add daasi-daa.
" " " " l. 9 add foot note Sé = flesh : neuba = good : gnolo = great.
" 373 col. English after line 34 add Evening Nomothipsing.
" " " Váyu l. 38 *for* swam *read* swom.
" " " " l. 5 *for* got *read* Got and add note to line 6 Wo for the males, mi for the females. Angki namsang = our own smell, Gyeti namsang = other smell. Therefore the suffixes wo and mi here form derivative substantives. In Ta-wo, Ta-mi they are merely sex signs. See on to adjectives for other uses.
" " " " l. 1 to 3 from bottom add note Chhyang is the instrumental and vi the agentive suffix. The verb is to p' to strike.
Page 374 col. Váyu l. 8 *for* Mechho-túnvi read mechho-túnvi.
" " " " l. 14 *for* khochi *read* khocho.
" " " " l. 18 add to Pok (abrupt accent).
" " col. English last line add Morning, Nomoloksing.
" " " Váyu l. 9 from bottom *for* Mynung *read* Minung.
" " " " l. 6 " " *for* Chája *read* Chháju.
" 375 col. English l. 12 *for* Oor *read* Oar.
" " " Váyu 2nd col. l. 17 add to Puchhí rú = head bone.
" 376 col. " l. 1 *for* Choli *read* Choti.
" " " " l. 7 *for* pronoun conveys *read* pronoun or verb conveys.
" 377 l. 3 of foot note for gothpto' read gothato.
" 379 1st col. Crude l. 44 to Luphta add (Lusta).
" " col. Affixes l. 8 *for* Participal *read* Participial.
Page 379 col. Affixes l. 10, add to follow. †Observe that all the numerous adjectives ending in vi, ta, or tang, are really participles, and also that none of them take a formative suffix such as belongs to the adjectives proper, as noh'ka, good. But in truth such adjectives almost never affix these signs, thus nohka tawo is a good boy and nohka tami is a good girl, and nohka singphun is a good tree. If you add the sign to a proper adjective, you make it

substantival, as nohka wo the good one (male). Adjectives derived from substantives (abstracts) indispensably require the suffixes, e. g. cnoti strength, chotiwo, strong, and also the strong one. See further remarks under the head of substantives.

„ 380 l. 13 *for* Healthful *read* Asleep.

„ 3 from bottom of note add and tuntang, what fit to be drunk.

„ 381 1st col. l. 23 *for* assert *read* apert.

„ „ 3rd „ l. 4 *for* partie *read* participial.

„ „ l. 16 *for* Participal *read* Participial.

„ „ l. 23 add Participles.

Page 383 2nd col. l. 15 dele má.

„ 384 1st „ l. 8 add or.

„ „ 2nd „ l. 24 *for* Pinkumu *read* Penkumu.

„ „ „ „ l. 33 add Genitival. But the mu neuter sign not required with nohka. With jingsa and with jekhom it is for they are substantives. See p. 379.

Page 385 2nd col. l. 13 *for* Chhingjimu *read* Chhingji.

„ „ „ „ l. 16 *for* Jishta *read* Jista.

„ „ „ „ l. 30 *for* Kwonghhet *read* Kwongkhet.

„ „ 3rd „ l. 1 *for* Participal *read* Participial.

„ „ „ „ l. 7 add — mu.

Page 386 1st col. l. 22 *read* fixed, firm or unshakeable.

„ „ 2nd „ l. 24 *for* Mélee *read* Mélbe and add as note, Mé = fire: Mébé khosta dressed in fire or with fire. Tí = water: Tíbe khosta dressed in or with water.

Page 387 add at bottom. N. B.—In reference to the suffixes, wo, mi, mu, See notes at p. 57 and 59 and 63. One of the equivalents for wo is cho, and pú is another. But the latter is rarely used and the former can be used with the ordinary signs of sex superadded as bing-cho = handsome and bang-cho = adult, whence bing-cho-wo formosus, bing-cho-mi formosa.

Insert the Numeral Collectives *at* p. 393 *after* the Vayu Numerals in p. 388.

Page 389 at l. 19, 27 & 44 add foot note. All these forms in hé, and (with the root doubled) in há are gerundial; see on to p. 436 &c. As the Adjectives are so often participles, so are the adverbs (and prepositions too, in less degree) gerundial.

Page 390 2nd col. l. 19 *for* Mi &c. *read* Mi, *or* Wáthi, lom khen.

„ 391 „ „ l. 2 *for* Kha khakha *read* khakkhakha.

„ „ „ „ l. 27 add after Vinvinha, (rounding, or rather, having rounded).

„ „ „ „ l. 51 for Cho'mi ithijila,' *read* Chomi. Hatha ithijila.

„ 392 1st col. l. 36 *for* Modesty *read* Modestly.

Page 393 2nd line from bottom add foot note. Literally, in the top and in the bottom for upon and under, super et infra. This form of prepositions, i. e. locative of the noun, is common owing to rarity of prepositions proper or case signs.

Page 394 2nd col. l. 5 & 6 *for* he *read é.*

„ „ „ „ l. 19 add foot note. †Observe that bek is *come* in, and bekla *go* in. So lok is come out and lokla is go out. The root lá, to go, is thus added to many verbs.

Page 395 „ „ l. 3 & 4 put *

„ „ „ „ l. 5 *for* hutimrekrá *read* hutimrekkúmchíng.

„ „ „ „ l. 21 *for* wanhé *read* or Chája wanhé.

„ „ „ „ l. 23 *for* huthe *read* or Chája huthé.

„ „ „ „ l. 28 *for* yongha *read* yonkha.

Page 396 „ „ l. 7 dele nungna and add Kamung nungna.

„ „ „ „ l. 32 add foot note. Better Áchho chep'chephá sastum. Literally, his body having perforated he pierced.

Page 397 „ „ l. 21 *for* mú *read* mü.

„ 398 „ „ l. 12, 34 and 43 add foot note. The s is essential, phasto, as proved by the conjugation which see. But in the imperative it is as spoken replaced by an abrupt accent, pha'to. In general, such an abrupt accent

before the sign in verbs transitive indicates a euphonically dropt consonant identical with that of the sign, so that the doubling of the sign of transitive verbs may be looked upon as the normal form, as proved by the conjugations, thus pho'ko = beget is phokko a derivative of bok' = be born, and pu'ko = awaken is pukko a derivative of the neuter buk'. Here are neuters made transitive by redoubled sign, added to a hardening of the initial consonant which is seen also in dum = become. Whence thum = cause to become. But besides this, the abrupt tone in transitives denotes a radical consonant similar to that of the sign and necessarily to be restored, thus to'po = strike must be toppo and chi'ko = break, chikko, &c.

Page 401 1st col. l. 27 add Ride.
,, ,, ,, ,, l. 29 *for* Iride *read* Irride.
,, 402 2nd ,, l. 14 *for* phá'to *read* phá'sto.
,, ,, ,, ,, l. 17 *for* pinu *read* ping.
,, 404 ,, ,, l. 27 *for* thá *read* that'.
,, 405 ,, ,, l. 49 *for* Po'ko or Pu'ko *read* Pu'ko pukko'.
,, ,, ,, ,, dele last foot note.
,, 406 ,, ,, l. 2 from bottom add (Tokko).
,, 407 ,, ,, l. 27 add (Poppo).
,, 408 2nd col. l. 36 add (after Theko)—Thésung, Thesche. Theto.
,, ,, ,, ,, l. 48 add, * Lún expresses run this way; Lún lá run that way, i. e. to and from the speaker. So also Rú and Rú lá just ahead and all other neuters to which lá is added.
,, ,, ,, ,, l. 49 dele * and foot note.
,, ,, ,, ,, l. 50 add (phasto). Lungpingko.

Page 409 1st col. l. 23 dele or.
,, ,, ,, ,, l. 45 and 48 *add* or him.
,, ,, 2nd ,, l. 4 add note * Rú expresses flee, or flee here. Rúla, flee away, free from.
,, ,, ,, ,, l. 16 add note † Hanto is causal as well as the next and normally causal form. Hánto is one of the numerous class of vèrbs which are at once transitive and causal in which the distinction of the two sorts of verbs is lost.
,, ,, ,, ,, last line *for* Suksa met'pingko not'pingko *read* Suksa met'pingko or Suksa not'pingko.

Page 410 1st col. l. 16 *for* cover *read* covert.
,, ,, 2nd ,, l. 13, 14, 19 & 22 *for* pháto *read* phásto.
,, ,, ,, ,, l. 24 *for* Jekhom ponchedum *read* Jekhom ponche, Jekhom dum.
,, ,, ,, ,, l. 31 add after dúm, (become).
,, ,, ,, ,, l. 45 add (phokko).

Page 411 ,, ,, l. 14 add. Thá totnachhe, D.
,, 412 1st col. l. 10 *for* been *read* him.
,, ,, 2nd ,, l. 19 *for* Nek'pingto *read* Nek'pingko.
,, ,, ,, ,, l. 26 add foot note to Thukto. ‡Duk neuter makes thuk transitive by initial hardening, just as dúm = become makes thúm causal or transitive. Of thukto thukpingko is the normal causal; but the latter is one of the numerous class of double causals, thukto being itself a causal. These double causals regularly formed, constitute one of the many correspondencies with the cultivated Dravidian tongues.
,, ,, 1st col. l. 8 from bottom add (phasto).
,, 413 2nd ,, l. 4 add Literally stay, verbally, by word.
,, ,, ,, ,, l. 14 add to Lu'ko (lukko).
,, ,, ,, ,, l. 21 *for* Teshto *read* Testo and add Tessung. Tesche.
,, ,, ,, ,, l. 22 add Literally, in thee wealth be or become.
,, ,, ,, ,, l. 33 add Mum pingko.
,, 416 ,, ,, l. 2 add (phasto).
,, ,, ,, ,, l. 8 *for* Lumthe *read* Lumche.
,, ,, ,, ,, l. 29 add foot note.† See note at p. 408. Dóng = arrive here. Dong lá arrive there. Só-yú = come down and Yúlá = go down.

Page 417 2nd col. l. 17 from bottom add foot note.† In composition lá only is used, as Beklá, Loklá, Yulá, &c.

" 418 1st col. l. 7 dele, tr.

" " " " l. 9 *for* Increase in length, n. *read* Increase thyself in length or be lengthened.

" " " " l. 19 add tr.

" " 2nd " l. 17 *for* vik ye ko *read* vik yekko, and add foot note. §Yekko, rukko, chokko, &c. are the true forms as proved by the reflex, causal &c. of each, and it is important to give them correctly in the imperative because the conjugation depends thereon, though in speech these imperatives avoid the cacophonous iteration of consonants (yek-ko, ruk-ko) by merging the first or radical one in an abrupt accent ye' ko, ru' ko.

" " " " l. 31 & 38 same note.

" 419 " " l. 2 & 10 *for* Peshto *read* Pesto.

" " " " l. 6 add Tú pingko.

" " " " l. 8 add Sé pingko.

" " " " l. 19 add Takko.

" " " " l. 21 *for* késsung *read* késung.

" " " " l. 22 *for* Yo'ho *read* yekko.

" 420 1st col. l. 7 *for* weight *read* weigh.

" " " " l. 3 *for* Thengko *read* Phengko.

" " " " l. 7 *for* Pu'ko, puksang, *read* Po'ko pukko, puksang.

" " " " l. 10 add or Tha puk'.

" " " " l. 21 after Piko add Pisung, Pi'che, Píto.

" " " " l. 25 (beat) *for* topsung *read* (beat) toppo topsung.

" " " " l. 27 *after* chu'ko *add* chukko.

" " " " l. 29 *for* chyássung *read* chyásung.

" " " " l. 44 add Sásche, Sássung.

" " " " l. 48 *for* chitó *read* chito, chisung, chiche.

" " " " l. 55 add to chi'po chippo.

" " " " l. 2 from bottom *for* phato *read* phasto and to chho'po add choppo.

" 421 1st col. l. 37 & 38 add See p. 424.

" " 2nd " l. 9 *for* vekpháto *read* vekphásto.

" " " " l. 16 add Rúpingko.

" " " " l. 35 add Ji.

" " " " l. 36 add Jito. Jísung. Jinche.

" " " " l. 38 *for* hhálang-nó-dúm, *read* chhálang-nó-dum.*

" 422 " " l. 8 add yekko.

" " " " l. 10 *for* Nengle *read* Nengla.

" " " " l. 12 add Ningche.

" " " " l. 13 add Ningsung.

" " " " l. 14 add Nengpingko.

" " " " l. 12 from bottom add to Blento foot note ‡l is a constant ad libitum in fix after initial b.

Page 423 " " l. 23 add foot note† Wash body = bathe is rip'che.

" " " " l. 27 add (phasto).

Page 424 2nd col. l. 4 *after* Tophto *add* Tosto.

" " " " l. 12 *for* Dáwáng Bocho, posung or posung *read* Dáwáng or Bochho, posung or pasung.

" " " " l. 13 *for* Dáwáng, Bochho, pánche *read* Dáwáng or Bochho pánche.

" " " " l. 19 *for* Ná'to, nassung, nasche *read* Nasto, nassung nasche.

" " " " l. 35 after Hon. (khon) add Hontadúm.

" " " " l. 38 *for* phato *read* phasto.

" " " " l. 2 from bottom add Khokta thumto.

Page 425 2nd col. l. 3 add to Lok, foot note.* Bek and Lok alone express the meanings, and the lack of empty words in this tongue causes it as often as pos-

sible to dispense with adverbial forms of speech thus, for come in it uses enter (bek) and for come out issue (lok) or appear.

Page 426 1st col. l. 38 *for* Behind the house *read* Behind, in back of the house.
„ „ 2nd col. l. 20 *for* Háhá pánachhe pochhe, Duals *read* Háha pánnachhe vel ponchhe, Duals.
„ „ „ „ l. 27 *for* (no Dat. or acc. sign.) *read* Kem (no Dat or acc. sign).

Page 429 *for* Comparative Vocabulary of the Languages of the broken Tribes of Nepal *read* Grammar of the Váyu Language.
„ „ l. 17 *for* nárgung *read* náyung.
„ 430 l. 5 *for* Gonargung *read* Gonayung.
„ 435 l. 8 *for* grammar *read* declension.
„ 441 dele note.
„ 442 l. 3 from bottom *for* in comparison *read* which in composition only, is.
„ „ add note to Pl. Im. Mood. The singular, dual and plural here refer as usual, to the agents. Those which follow refer to the objects the combination of which with the agents in the conjugation of verbs (transitive) constitutes the peculiarity of this language, as of the following wherein it is more fully carried out.

Now turn to the passive voice and you will see the positions of these personal endings reversed, the starting point being the citation of the objects or patients whence the verb becomes passive, so far as that voice can be said to exist. The inversion, however, though usual is not quite indispensable. See remarks in sequel. Passivity is denoted by the object : but so also is transitiveness ; and hence the many forms common to both voices. They are denoted by a cross † prefixed.

Page 445 after line 22 add of the object* and foot note. See note at page 442.

Page 449 *after* negative mood *add* of indicative singular.

Page 450 after lines 25 and 34 add of the object* and foot note. " See remark at p. 126.

Page 451 l. 2 from bottom *for* Sista nó-dum *read* Sista $\left\{\begin{array}{l}\text{no.}\\ \text{dum.}\end{array}\right.$
„ 452 l. 3 *for* dam *read* dum.
„ „ l. 18 dele kha.

Special forms at pp. 452 and 457 to be inserted at the end of the ordinary conjugation, or after " Causals" of sequel.

Page 453 last line add top-po.
„ 455 after line 29 add of the object.
„ 457 at top add Indicative present.
„ „ l. 2 *for* sheer neuters (see phi) *read* pages 451, 452.
„ „ l. 3 from bottom *for* prior note at Sishto *read* prior verb, pp. 451, 452. and add after Váyu active and passive.

Page 464 l. 3 add foot note. *Observe that these are singular, dual and plural of the *object*, as noted elsewhere.
„ 465 Special forms to be inserted after continuative Mood in p. 465.
„ 467 add to line 4 from the bottom (potius Phok).
„ 468 l. 5 add (phokko).
„ 481 l. 11 *for* equal fusion in both cases *read* equal degree of fusion in regard to both noun and verb.
„ „ l. 27 *for* 3rd *read* 3.
„ „ l. 30—36 *for* compare &c. &c. *down to* strike *read*

$\left.\begin{array}{l}\dagger\ \text{á-pá, my}\\ \text{í-po, thy}\\ \text{á-po, his}\end{array}\right\}$ father. $\left\{\begin{array}{l}\text{teub-ú, I}\\ \text{teub-í, thou}\\ \text{teub-á, he}\end{array}\right\}$ strike.

Wherewith compare

Sontal		and Kuswar.	
apu-ing	dal-eng, aïng.	Baba-im.	Thatha-im-ik-an.
apa-m	dal-me, am.	Baba-ir.	Thatha-ir-ik-an.
apa-t	dal-e, aï.	Baba-ik.	Thatha-ik-an.

Page 484 l. 23 add foot note. ‡ Take notice that this sample of the language is also meant to exhibit the status and condition of the people as viewed by themselves.

,, ,, l. 24 *for* Páte *read* Pachya.

Page 486 *for* Bahing Vocabulary *read* Grammatical analysis of the Bahing dialect of the Kiranti Language.

,, ,, 2nd col. l. 16 add foot note. † So from Koja = belly is formed kojacha = glutton ; and from Khojim = house, Khojimcha = householder.

Page 488 1st col. l. 7 and 35 add foot note. Formed respectively from kholi = leg and gú = arm. The suffix blem is a segregative indicative of the clsss of flat things.

,, ,, 2nd col. l. 29 *for* Rúpachó *read* Rúpacho grokso.

,, ,, ,, ,, l. 30 *for* Grokso *read* Rúpachóme.

,, ,, last line *read* ú the first person = wa of the noun.

,, 489 1st col. l. 11 add Lowland = Dhípté.

,, ,, 2nd col. l. 23 add apobing.

,, ,, ,, ,, l. 24 dele Gia.

,, ,, ,, ,, l. 25 dele Gai atámi.

,, ,, ,, ,, l. 29 add note ‡See note at urine.

,, 490 last line add literally, cane its juice.

,, 491 1st col. l. 5 *for* Muryuácharniku *read* Muryeuácharniku.

,, ,, l. 6 add note § Múryeu á charnika, mankind, its urine. Songara á charnika, goat kind, its urine, the common form of the genitive. See " ordure.'

Page 492 1st col. l. 17 *for* bokab *read* bokba.

,, ,, ,, ,, l. 2 from bottom *for* both are senses *read* both senses.

,, 495 ,, ,, l. 3 from bottom add after wala, of Urdu.

,, ,, ,, ,, l. 2 from bottom *for* Gigimmo *read* Gigimmé.

Page 497 2nd col. l. 24 *for* Kwong ásim one score = Kwong and one *read* Kwong ásim Kwong = one score and one.

Page 500 2nd col. l. 4 add excl.

,, ,, ,, l. 5 add incl.

,, ,, 1st col. l. 27 add foot note. ‡Observe the gí, to be born, becomes by hardening kí, to beget. But kí also means, cause to be born and so far is a causal though the ordinary causal is formed by páto. Hence if we add pato to the transitive kí we have a double causal. This is common to all the verbs of the sort and is a Dravidian trait.

,, ,, l. 5 from the bottom *for* woncho *read* wonche.

,, 501 1st col. l. 3 *for* Thiyato *read* Thipato.

,, 512 1st col. l. 2, 3 and 4 *for* Thyangso *read* &c. &c. Phyangso.

,, 515 1st col. l. 42 add foot note after Khyimá gwáre. Khyím á-gwáré, literally, house, its interior in. This use of the conjunct pronominal sign in lieu of a genitive (house its inside) and of a noun in the locative case, in lieu of an adverb or preposition, are both normal and common to this and the foregone language.

Page 518 2nd col. l. 37 *for* riskso *read* Namrikcho.

,, 519 2nd col. l. 20 *for* Newar dau khwag no, *read* Newar dau khwog no.